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Supreme Court of the United States

OCTOBER TERM, 1964

No. 154

SERVO CORPORATION OF AMERICA,
Petitioner,

vs.

GENERAL ELECTRIC COMPANY,
Respondent.

APPENDIX
TO
PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FOURTH CIRCUIT

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INDEX TO APPENDIX

PAGE

Opinion of Fourth Circuit Court of Appeals A1

Judgment of Fourth Circuit Court of Appeals A19

Order on Petitions for Rehearing A20

Opinion of U.S. District Court (pertinent to Petition for Certiorari issue) A22

Judgment of U.S. District Court A40

Report of Special Master (portion pertinent to Certiorari issue) A42

Conclusions of Special Master A77

Constitutional and Statutory Provisions A79

Servo Corporation's Petition for Rehearing A80

Petition for Rehearing Record References A93

Testimonial References:

Plaintiff's Exhibit 226—Institute of Radio Engineers Publication A95

Testimony of Dr. Stanley S. Ballard A96

Testimony of Alfred H. Canada A100

Plaintiff's Exhibit 289—General Electric A102

Testimony of Edward G. Mennecker A104

Testimony of William D. Cockrell A105

Opinion of Court of Appeals

UNITED STATES COURT OF APPEALS

FOURTH DISTRICT

No. 9190

Argued April 15, 1964.

Decided Sept. 30, 1964.

SERVO CORPORATION OF AMERICA,
Appellee and Cross-Appellant,

v.

GENERAL ELECTRIC COMPANY,
Appellant and Cross-Appellee.

Patent infringement and unfair competition case. The United States District Court for the Western District of Virginia, at Roanoke, Ted Dalton, J., 220 F.Supp. 473, rendered judgment, and appeals were taken. The Court of Appeals, J. Spencer Bell, Circuit Judge, held that patents relating to use of devices known as "hot box detectors" were invalid and that there had been unjust enrichment.

Remanded.

Before SOBELOFF, Chief Judge, and HAYNSWORTH and J. SPENCER BELL, Circuit Judges.

J. SPENCER BELL, Circuit Judge:

Servo Corporation of America [hereinafter Servo] charges General Electric Company [hereinafter General

Electric] with wilfully infringing three patents[1] relating to the use of devices known as "hot box detectors." Additionally, Servo charges General Electric with acts of unfair competition and unjust enrichment in the deliberate and wilful appropriation and copying of engineering techniques and methods developed by Servo.

In the proceedings below[2] the district court and the master found one of the patents, the '857 Shutter Patent, invalid, and Servo has not appealed from that portion of the judgment. The district court affirmed the master's findings of validity and infringement of the '309 Orientation Patent, but it reversed his finding that the patent had been wilfully infringed. The district court reversed the master's findings of validity and infringement with respect to the '575 Alarm Patent. Finally, the district court rejected the master's finding that General Electric had been guilty of unfair competition by utilizing Servo's detailed engineering data in the construction of General Electric's device. The questions of damages and attorneys' fees were reserved. Both parties appealed. We hold both the '309 Orientation Patent and the '575 Alarm Patent invalid and, therefore, not infringed. We reverse the district court's judgment with respect to unfair competition and unjust enrichment.

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[1] Patent No. 2,947,857—"The Shutter Patent,"
Patent No. 2,880,309—"The Orientation Patent" (Pelino and Gallagher, patentees—Servo, assignee),
Patent No. 2,963,575—"The Alarm Patent" (Pelino and Remz, patentees—Servo, assignee).

[2] The district court's opinion is reported at 220 F.Supp. 473 (W.D.Va. 1963).

I

The Pelino-Gallagher '309 Orientation Patent.

The '309 Orientation Patent does not claim to have originated the hot box detector as such, but only the position in which such a detector should be placed and the target at which it should be aimed to achieve commercially feasible results. The patent relates to an infrared railroad hot box detector system wherein temperature-measuring devices, generically referred to as pyrometers, are mounted alongside a railroad track in such a position as automatically to inspect the radiated heat from each journal box on a passing train. Electrical signals, proportioned in amplitude to the amount of infrared heat received by the hot box detector from passing journal boxes, are automatically produced by the detector and recorded instantaneously with a pen recorder on a paper chart as the train passes.[3] A heat profile comprising a series of pips is accordingly provided for each side of the passing train and is available for convenient evaluation. Thus the operating condition of any journal box on the train may be ascertained.

Though the patent in question is entitled a hot detector, it correctly acknowledges the earlier development by others of infrared heat-sensitive apparatus capable of sensing the temperature of moving objects, including the journal boxes of railroad cars. It is elemental, of course, that any such apparatus would have to be mounted in such a position as to have an uninterrupted or "line-of-sight"

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[3] The hot box detector derives its ability to sense the temperature of journal boxes from the use of a temperature sensitive device called a thermistor bolometer. Thermistor bolometers were invented by scientists of the American Telephone & Telegraph Copany and made available for commercial use in about 1950. Both parties to this suit are licensed by the Telephone Company to make and use such bolometers.

view of a journal box (or any other object) whose temperatures was to be observed. Further, since journal boxes on a passing train are interspersed with other heat sources (such as brake shoes, steam hose, and hot wheel rims), it was necessary to provide for the exclusion of signals emanating from these irrelevant sources. For this purpose a method of "gating" was suggested. This was accomplished by magnetic wheel trips which, when run over by the wheels of passing cars, automatically opened or closed the circuit which carried the signals from the scanning device to the recorder. These gating devices were of two types. With one, the circuit was kept open for a predetermined period of time. With the other, by placing two trips on the rail, the first opened and the second closed the circuit. Everything thus far described—the heat-sensing pyrometer, the necessity for a line-of-sight view of the target, and the gating function to cut out extraneous heat sources— were all disclosed by patents for hot box detectors issued before the patent in question.

Thus the Servo '309 patent is in no sense a basic or pioneer patent; it does not purport to have originated the hot box detector as such. Rather, it teaches the position in which such a detector should be placed and the target at which it should be aimed in order to achieve a commercially feasible permanent installation which avoided certain problems inherent in the prior art. This position necessarily was limited by consideration of the physical environment and railroad regulations restricting trackside installations. In the words of Servo's brief:

> "The principal claimed invention of this patent is directed to the definition of the viewing axis orientation and the location of the trackside mounted infrared sensing detector elements in relation to passing railroad cars so as to utilize an advantageous aspect of the car bodies as a uniform background reference against which the infrared heat

radiated by significant portions of the journal boxes is compared."

Thus, the question for the court is whether the discovery of this position as disclosed by the claims of the patent constitutes invention. We hold that it does not.

This answer is not contingent upon resolving conflicting testimony, since the basic facts are not seriously in dispute. We simply hold that the standard of invention as applied by the master and the district court is not up to the legal standard required by the governing statute, 35 U.S.C.A. §103.[4] See *Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 153, 71 S.Ct. 127, 95 L.Ed. 162 (1950).

We think it clear that what Servo has done here is to ascertain the optimum conditions for the use of the hot box detector; and whether this was achieved by experiment in the field, as contended by General Electric, or by contemplation in the laboratory, as Servo contends, is immaterial. The objective was discoverable by experiment, and no new or unique combination of old ideas producing or performing a different or additional function has resulted. *Triumph Hosiery Mills, Inc.* v. *Alamance Industries, Inc.*, 299 F.2d 793, 798 (4 Cir. 1962). As stated by the Court of Customs and Patent Appeals: "It is well settled that a patent cannot be properly granted for the discovery of a result which would flow naturally from the teaching of the prior art." *In re Adams*, 284 F.2d 525,

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[4] 35 U.S.C.A. § 103 provides:

"A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

527 (C.C.P.A. 1960); *Entron of Maryland, Inc.* v. *Jerrold Electronics Corp.*, 295 F.2d 670 (4 Cir. 1961).

That Servo's scientists were not the first to conceive the idea of a hot box detector mounted below axle level or even at rail level is clearly demonstrated by the file wrapper and especially the Johannson patent. It is also true that they were not the first to conceive the idea of scanning the sides of the journal boxes at or near their tops.[5] Even if they were, the information furnished by the railroads concerning the heat characteristics of hot journal boxes would make this area an obvious target to anyone skilled in the science of pyrometers. Servo is, therefore, reduced to claiming the discovery of the critical angles at which a hot box detector placed below axle level operates most efficiently. Even if we assume that these critical angles are suffciently disclosed by the claims of the invention, particularly claims 5 and 6, we are still left with the principle that criticality is not invention. *Helene Curtis Industries* v. *Sales Affiliates, Inc.*, 233 F.2d 148, 152 (2 Cir. 1956). It is clear that that part of the detector which scans passing journal boxes did not perform any new function when placed in this particular position. It merely performed the same functions more efficently. "Invention is more than recognition of latent qualities in prior art without any physical or objective change in that art." *Zoomar, Inc.* v. *Paillard Products, Inc.*, 258 F.2d 527, 529 (2 Cir. 1958). Servo's elaborate explanation concerning the benefits of the uniform background achieved by its positioning of the scanner does not argue patentability. This is also true of its argument that the toed-in angle more particularly described in claim 6 avoids irrelevant heat sources. These are but rationalizations or explanations of particular adaptation of known and obvious principles—the inevitable result of experimentation. Similarly, while the commercial success enjoyed by Servo's

[5] The patent application was clearly misleading in this respect.

detector leaves no doubt that it has produced a useful device, commercial success cannot produce patentability where none existed before.[6] *Triumph Hosiery Mills, Inc.* v. *Alamance Industries, Inc.*, 299 F.2d 793, 800 (4 Cir. 1962). In *Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 153, 71 S.Ct. 127, 130, 95 L.Ed. 162 (1950), Mr. Justice Jackson wrote:

> "The Court of Appeals and the respondent both lean heavily on evidence that this device filled a long-felt want and has enjoyed commercial success. But commercial success without invention will not make patentability."

The reliance of the master and the district court on the presumption of validity which attaches to an issued patent is misplaced in view of the failure of Servo's scientists to disclose the railroads' contribution to their success. While the master found that the railroads did not specifically inform Servo of the exact area on the journal box which would best serve as a target, there is no question that the railroads had conducted a great deal of experiment and knew the relative temperatures of the various surfaces of the journal box. Even a casual consideration of this information made it obvious that the top and upper sides of the boxes absorbed and radiated nearly three times as much heat from the overheated journal bearings as any other area. It need hardly be said that this being known, the choice of the upper portion of the trailing side of a journal box as preferable to the loosely connected journal box lids or any other area was obvious to anyone

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[6] Nor do we think Servo's argument that the railroads had long sought a solution to the problem will bear analysis. In the first place, Servo did not solve the problem; it contributed a very minor step. In the second place, the possible solution did not exist until the pyrometer was developed in the 1950's. And finally, the railroads were interested in methods of prevention rather than discovery and cure of the hot journal box problem.

skilled in the art. This would explain why Servo soon withdrew from the suit claim 1, which teaches looking at any part of the box except the lid. Thus the optimum target was disclosed to Servo and was no part of its discovery.

Nor can Servo claim that it first conceived the idea of mounting the device below the level of the journal box and specifically at the level of the rails. This was proposed by McDonald about three weeks prior to the earliest asserted date of invention. It was also disclosed by the Johannson patent. While both Johannson and McDonald suggested that the device be placed between the rails, instead of outside the rails, and view vertically upward, Fattor five years before in his proposal to the Association of American Railroads Committee on the development of hot box alarm devices suggested positioning a hot box detector at rail level outside the tracks and viewing the sides of the journal boxes upwardly and parallel to the tracks. While it is true that both the master and the district court doubted that Fattor's proposals received the degree of publicity necessary to constitute prior art and while there is no evidence that Servo ever learned of them, nevertheless they constitute evidence of the obviousness of this position as one which would logically be considered for a permanent installation by anyone skilled in the art. *United States Pipe and Foundry Co.* v. *Woodward Iron Co.*, 327 F.2d 242 (4 Cir.), rehearing denied, 329 F.2d 578 (4 Cir. 1964).

Consequently the track-level and parallel to the tracks view cannot be claimed as Servo's invention because it was either disclosed or obvious from the prior art. And indeed, this position was found not to be feasible, because certain conformations of the railroad cars made it necessary to aim the scanner placed in this position at an angle which caused it to see the sky between certain types of cars. It was this deficiency which inevitably led Servo to move the scanner outwardly from the rails and toe it in

so that it could avoid this drawback. It is the toed-in position described in claim 6 which is the crux of Servo's patent. The so-called invention involved in the toed-in angle of claim 6 was a natural and obvious successor step to the track-level-parallel to the track position of claim 5. Thus the act of Servo in taking one of the known positions disclosed by the prior art and moving the device outwardly from the rail, so as to accommodate the geometry of the truck frames of railroad cars, was not invention; this modification was an ordinary engineering matter obvious to one skilled in the art. Having reached this conclusion, the claimed advantage that the position chosen allows the device to see only the quiescent background of the underside of the car will not render an otherwise unpatentable method patentable.

Having decided that Servo must fail for lack of invention, we do not reach the issue of infringement or the defenses of failure to disclose the best method of practicing the invention, as required by 35 U.S.C.A. § 112, or that detectors embodying the claims of the patent were by the plaintiff placed on sale, sold, and in commercial use more than a year prior to the filing of the continuations in part application on June 30, 1958, as prohibited by 35 U.S.C.A. § 102.

Considering the report of the master, which was extremely detailed and meticulous, and the opinion of the district court, we think that both were so impressed with the novelty, usefulness, and the commercial success of the application of the principle of the pyrometer to the problem of hot journal box detection that they failed to concentrate their attention on Servo's relatively minor contribution to the overall solution of the problem. When this contribution is extracted from the prior art and viewed in isolation, its obviousness is apparent. It does not rise to the statutory standard of invention.

II

The Pelino-Remz '575 Alarm Patent.

The purpose of this device was to receive the signals from the hot box detector, to automatically evaluate these signals, and when they so indicated, to activate an alarm device calling the dangerous condition to the attention of railroad personnel, thus obviating the necessity of maintaining constant supervision and interpretation of the recorder charts. The patent advanced the concept of double differential comparison of opposite axle-end heat signals. In order to do this it was necessary to make two electronic difference comparisons. The temperature of each end of the axle had to be subtracted from the other. If the temperature difference in either case exceeded the preset threshold temperature indicative of trouble, the alarm was activated. An additional function was performed by including in the circuit electronic means for briefly storing the separate axle-end heat signals after they had been passed through an electomagentic gate and amplifier. This was necessary because the two ends of a given axle were sometimes skewed to such an extent that they could not be simultaneously scanned. Finally, the device contained a counting means which counted the wheels or axles which passed the device after an alarm was activated, thus enabling railroad personnel to locate the defective axle promptly.

While claims 3, 4, and 5 are apparatus claims, the basic inventive concept which is claimed for the patent is set forth in claim 20, a method claim. The patent was apparently issued because the applicants persuaded the Patent Office that they first conceived the idea (embodied in this method) of applying existing methods of comparing temperatures, storing signals, and sounding alarms to infrared hot box detection. The district court rejected the findings and conclusions of the master of patent validity.

The uncontested evidence shows that Berti, an employee of the Union Pacific Railroad, wrote Servo nearly 3 years before the invention date suggesting the application of this basic idea to pyrometer hot box detection. True, Berti suggested four scanners simultaneously examining four axles—two on each side of the car—and comparing them for an alarming differential, but Servo almost immediately proposed that the idea be applied to two journal boxes on the same side of the track. Finally Pilcher's contemporaneous notes show that Servo had suggested applying the idea to opposite ends of the same axle at least six months before the collaboration of Pelino and Remz, the claimed inventors. When the field experiments disclosed that a substantial difference in normal operating temperature existed between friction type axles and roller bearing axles, it was a simple and obvious step to utilize this principle in comparing the opposite ends of the same axle in order that the differences between normal operating temperatures of the two types of bearings might not actuate the alarm on the hotter running axle when in fact no danger existed. Thus, the advance, if any, which the Pelino-Remz patent made over the prior existing art was obvious to anyone skilled in this field.

The electronic circuitry involved in the patent is a bridged circuit. To design and use a bridge circuit to compare two electronic signals was conceded by the electrical engineers who testied to be an elementary problem. The use of capacitors to store out-of-phase signals—which might emanate from journal boxes on a skewed angle—prior to comparison clearly reads on the Chubb patent issued in 1926 and others discussed in the record.

We hold that the patent is invalid for obviousness, and consequently we do not reach the question of infringement. Since 3, 4, and 5 are apparatus claims which fall far short of pioneer status, they would, in any event, be limited to the circuitry shown in the specifications. 35 U.S.C.A. § 112.

We think that the master was in error in the standard

of invention which he applied in finding patentability in the '575 Alarm Patent. Utility is conceded, but utility is not novelty, and utility alone is not patentable. *Toledo Pressed Steel Co.* v. *Standard Parts, Inc.*, 307 U.S. 350, 59 S.Ct. 897, 83 L.Ed. 1334 (1939).

III

Unjust Enrichment.

The master found that General Electric willfully infringed and copied Servo's '309 patent in several respects. He concluded that the evidence was not sufficient to sustain a finding that General Electric had copied Servo's '575 patent. The district court, while rejecting the finding of wilful infringement and consequent punitive damages, also found:

> "Similarly, on the question of copying, the Court is of the opinion that from Cockrell's visit to Salisbury and from the work and information flowing from Servo, G. E. gleaned or copied ideas that belonged to Servo under the '309 patent which we hold valid, and insofar as Servo has been actually damaged thereby, it is entitled to recover. But again, to the Court there is not sufficient basis to award punitive damages." 220 F.Supp. at 485.

We think the evidence overwhelmingly supports the master's finding and that the district court erred as a matter of law in rejecting the plaintiff's claim for unjust enrichment. There is ample evidence in the record to support Servo's contention that its relationship with Southern during the installation and testing of its detector at Salisbury, North Carolina, was a confidential one and that Southern understood this. The district court's error lay in its failure to give proper weight to this confidential

relationship in its consideration of Servo's claim. The case is not one of an outright sale without reservations or requirements of nondisclosure. Servo's proposal, on the basis of which the installation was made, contained the following provisions:

> "Servo Corporation of America has a proprietary interest in the information contained herein, and in some instances has patent rights in the systems and components described and requests that you distribute it only to those responsible people within your organization who have an official interest. Insofar as the material contained in this document is novel Servo Corporation of America retains a proprietary interest in its development and manufacture."

The Vice President of Southern in charge of this matter acknowledged that he was familiar with the terms of this proposal. The railroad's interoffice memorandum of March 12, 1955, the letter of May 20, 1955, from Servo's manufacturing agent to the railroad quoting prices for the equipment, and indeed the deposition of the Vice President himself make it clear that Southern understood that it was cooperating with Servo in experimental work. These facts clearly support the master's finding that Southern had entered into a confidential relationship with Servo and thus had a duty of nondisclosure at the time that General Electric's engineers appeared upon the scene.

It is also clear from the record that General Electric ceased its activities in the hot box detector field near the close of the year 1955. At that time its experimental department reported the infrared detection of hot journal boxes as feasible but involving some difficult problems in practical application. Not until the spring of 1958 did a manufacturing department of General Electric again take up this work. At this time Servo had installed its detector on Southern's tracks at Salisbury, North Carolina.

Southern was extremely critical of the price charged by Servo and frankly sought to develop an alternate supply. While this situation existed, a group of General Electric's engineer personnel including most of those who subsequently developed its detector met with the Southern officers in Washington. On April 10, 1958, General Electric's engineers went to Salisbury, North Carolina, where they examined the Servo installation. Members of the party photographed the installation, brought back with them Southern's drawings of the installation, and examined a diagram of the installation made by Servo. From the report made the following day, it was clear that the party had gained valuable information which reflected much, if not all, of Servo's engineering development and field experimentation. There is strong evidence from Southern's files that General Electric requested Southern's permission to make the visit, and further, General Electric's Sales Manager for the hot box detector admitted that he *likely* made the suggestion to go to Salisbury. In any event, we think it immaterial who initiated the trip.

On May 12, 1958, one of General Electric's engineers made a drawing of a detector which it proposed to build for Southern. The device contained most of the principal characteristics of the Servo device, including the so-called critical angles. Southern would not agree to share the development costs, and General Electric did not attempt to build the detector. Not until the Norfolk and Western Railway put up $25,000.00 later in that year did General Electric become seriously interested in producing a prototype device. Within an incredibly short time after this, General Electric was producing detectors embodying many of Servo's engineering features. While General Electric strenuously contends that it was capable of and did in fact develop its detector entirely independent of the information it procured from the Salisbury trip, the master has found differently, and we think the evidence clearly sufficient to support his finding. Nor are these findings over-

come by General Electric's denial of guilt, a denial expressly rejected by the master.

Courts long have recognized that where the holder of a trade secret imparts it to another in confidence and that other person then appropriates it for his own use, equitable remedies may be invoked to right the wrong. That it is not necessary that the trade secret be covered by patent was made explicit by the early and oft-quoted case of *Booth* v. *Stutz Motor Car Co. of America,* 56 F.2d 962 (7 Cir. 1932). There, one Booth disclosed in confidence to Stutz officials his plans for the design of an automobile. The company thereafter utilized these plans in producing a new car without offering recognition or remuneration to Booth. Booth brought an action for damages, alleging two causes of action: (1) patent infringement and (2) wrongful appropriation of his plans. The district court dismissed both counts. On appeal, the Seventh Circuit affirmed dismissal of the first count, holding that Booth's reissue patent involved no patentable advance over prior art and was, therefore, invalid. The court went on to reverse the lower court's dismissal of the second count, holding that Booth had established his right to damages for the company's wrongful appropriation, and remanded the case for the assessment of damages.[7]

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[7] The basis of such damages was stated in *International News Service* v. *Associated Press,* 248 U.S. 215, 240, 39 S.Ct. 68, 72, 63 L.Ed. 211 (1918), where the Court awarded damage to the Associated Press as compensation for its rival's practice of appropriating news releases, as follows:

> "Stripped of all disguises, the process amounts to an unauthorized interference with the normal operation of complainant's legitimate business precisely at the point where the profit is to be reaped, in order to divert a material portion of the profit from those who have earned it to those who have not; with special advantage to defendant in the competition because of the fact that it is not burdened with any part of the expense of gathering the news. The transaction speaks for itself and a court of equity ought not to hesitate long in characterizing it as unfair competition in business."

This court has applied the rationale of the *Booth* case to several cases arising in this Circuit. *Chesapeake & O. Ry.* v. *Kaltenbach,* 95 F.2d 801 (4 Cir. 1938); *Hoeltke* v. *C. M. Kemp Mfg. Co.,* 80 F.2d 912 (4 Cir. 1935), *cert. denied,* 298 U.S. 673, 56 S.Ct. 938, 80 L.Ed. 1395 (1936). Both involved claims for damages for the appropriation of commercial devices, in breach of confidence, prior to the issuance of a patent. As we said in *Hoeltke* v. *C. M. Kemp Mfg. Co., supra,* 80 F.2d at 922-23:

> "The general rule, of course, is that the monopoly of a patent which entitles a patentee to damages for infringement commences only when the patent is granted; but where, in advance of the granting of a patent, an invention is disclosed to one who, in breach of the confidence thus reposed, manufactures and sells articles embodying the invention, such person should be held liable for the profits and damages resulting therefrom, *not under the patent statutes, but upon the principle that equity will not permit one to unjustly enrich himself at the expense of another.* The question was before the Circuit Court of Appeals of the Seventh Circuit in the recent case of Booth v. Stutz Motor Car Co. of America (C.C.A. 7th) 56 F.(2d) 962, and we think the decision there rendered is eminently sound and just. It would be a reproach to any system of jurisprudence to permit one who has received a disclosure in confidence to thus appropriate the ideas of another without liability for the wrong." Emphasis added.)

The continuing validity of this principle was considered and reaffirmed in *Saco-Lowell Shops Reynolds,* 141 F.2d 587, 598 (4 Cir. 1944). Accord, *Friedman* v. *Washburn Co.,* 145 F.2d 715, 718 (7 Cir. 1944); *Picard* v. *United Aircraft Corp.,* 128 F.2d 632, 637 (2 Cir.), *cert. denied,* 317 U.S. 651, 63 S.Ct. 46, 87 L.Ed. 524 (1942). *Cf. Becher* v.

Contoure Laboratories, Inc., 279 U.S. 388, 49 S.Ct. 356, 73 L.Ed. 752 (1929); *Kirschner* v. *West Co.*, 300 F.2d 133 (3 Cir. 1962); *Eckert* v. *Braun*, 155 F.2d 517 (7 Cir. 1946). See generally Annot., 170 A.L.R. 449 (1947).

Because of the confidential relationship which was betrayed here by Southern, this case is distinguishable from *Sears, Roebuck & Co.* v. *Stiffel Co.*, 376 U.S. 225, 84 S.Ct. 784, 11 L.Ed.2d 661 (1964). In that case the action was grounded upon state law which gave a remedy for copying resulting in confusion as to the source of manufacture. In that case the Court held that a manufacturer whose design and mechanical patents are invalid for want of invention cannot under state unfair competition law obtain an injunction against copying its product, nor an award of damages for such copying, as such use of state law conflicts with the federal government power to grant patents. The Court went on to hold that an unpatended article being in the public domain may be freely copied as the federal patent law had preempted the field from state action. This case, however, is one of unjust enrichment through breach of a confidential relationship, and the remedy is derived from the court's power to award general equitable relief. In *Saco-Lowell Shops* v. *Reynolds, supra*, 141 F.2d at page 598, we held:

> "[W]hether the [inventor's ideas] were covered by patent or not, he was entitled to protection against their use by one to whom he had disclosed them in the course of a confidential relationship."

General Electric contends, however, that the information was procured from Southern, not from Servo, and that it breached no confidence existing between it and Servo. We think that General Electric may not so easily insulate itself from liability. The RESTATEMENT, TORTS, § 757 (1939) provides:

> "One who discloses or uses another's trade secret,

> without a privilege to do so, is liable to the other if * * *
>
> "(c) he learned of the secret from a third person with notice of the facts that it was a secret and that the third person discovered it by improper means or that the third person's disclosure of it was otherwise a breach of his duty to the other * * *."

We think the above rule salutary and applicable to the facts present here. General Electric was aware of the confidential relationship existing between Southern and Servo. The detector business was in its infancy—the device in question, while operating sufficiently well to make its use practical, was still the subject of discussions between the parties involving changes and improvements, and it was abundantly clear that the Southern itself was a potential customer for a great many more of the devices. General Electric and Southern were *in pari delicto,* and General Electric may not escape liability in a court of equity.

Several cases have held that a businessman who hires his rival's former employee and induces the employee to divulge the rival's trade secrets imparted in confidence may be required to respond in damages. *A. O. Smith Corp.* v. *Petroleum Iron Works Co. of Ohio,* 73 F.2d 531 (6 Cir. 1934), modified on another point, 74 F.2d 934 (6 Cir. 1935); *Herold* v. *Herold China and Pottery Co.,* 257 F. 911 (6 Cir. 1919). The facts here vary; the principle remains constant. General Electric learned that which it needed to know through Southern, and both parties knew that their concerted activities were in violation of the confidence reposed in Southern by Servo. Under the circumstances the plaintiff is entitled to recover of the defendant the reasonable value of the data acquired and utilized by it in unfair competition with the plaintiff. See *International News Service* v. *Associated Press,* 248 U.S. 215, 39 S.Ct. 68, 63 L.Ed. 211 (1918).

Finally, Servo complains that the district court ignored the mandate of Rule 53(e) (2), FED.R.CIV.P. in failing to show that the master's findings were clearly erroneous. While the court was not careful in its language dealing with the master's report, we think that its was cognizant of the burden placed upon it by Rule 53(e) (2) with respect to the master's findings of fact. In any event, in reversing both the master and the district court on questions of law with respect to the validity of the two patents remaining in the suit, we have rendered largely academic any factual differences of opinion between the two, for we think the factual differences are minor and not relevant to our decision of the legal question. With respect to the issue of unjust enrichment, we find the district court clearly in error in rejecting the master's findings of fact, which we hold to be amply supported by the evidence.

Remanded.

Judgment of Court of Appeals

UNITED STATES COURT OF APPEALS

FOR THE FOURTH CIRCUIT

No. 9190

Appellee and Cross-Appellant

Appellant and Cross-Appellee

SERVO CORPORATION OF AMERICA,
Plaintiff,

-v-

GENERAL ELECTRIC COMPANY,
Defendant.

DECREE

Cross appeals from the United States District Court for the Western District of Virginia.

This cause came on to be heard on the record from the United States District for the Western District of Virginia, and was argued by counsel.

On consideration whereof, it is now ordered, adjudged and decreed by this Court that the decree of the said District Court appealed from in this cause be and the same is hereby affirmed in part and reversed in part; that this cause be, and the same is hereby remanded to the United States District Court for the Western District of Virginia at Roanoke for further proceedings consistent with the opinion of the Court filed herein; and that each side bear its own costs on appeals.

J. SPENCER BELL
United States Circuit Judge

September 30, 1964
Filed September 30, 1964

Circuit Court of Appeals Order on Rehearing

UNITED STATES COURT OF APPEALS

FOR THE FOURTH CIRCUIT

No. 9190

SERVO CORPORATION OF AMERICA,
Appellee and Cross-Appellant,

versus

GENERAL ELECTRIC COMPANY,
Appellant and Cross-Appellee.

Order Denying Petitions for Rehearing

After careful consideration, the court being of the opinion that no good cause is shown, the petitions to rehear filed by both the parties to this appeal are denied.

We think it consistent with the opinion heretofore filed that the district court should allow Servo damages only for General Electric's appropriation of that portion of its work which was not publicly disclosed prior to the visit to Salisbury on April 10, 1958, and that these damages should be measured by General Electric's cost of acquiring the same information by its own experimentation. It is, therefore,

ORDERED that the said petitions be, and they are hereby, denied.

February 18, 1965.

CLEMENT F. HAYNSWORTH, JR.
United States Circuit Judge

SIMON E. SOBELOFF
United States Circuit Judge

A true copy,
Teste:

J. SPENCER BELL
United States Circuit Judge

MAURICE S. DEAN, *Clerk*,
U. S. Court of Appeals for the
Fourth Circuit

By GRACE C. TUCK,
Deputy Clerk

Opinion of Ted Dalton, United States District Judge

A tiny flake of a metallic substance the size of a mouse's toenail, when activated by infrared waves, sets into motion a chain of events which form a background for this important litigation.

An age-old problem confronting railroads everywhere has been the ever recurring "hot journal box" which house the brass bearing that fits over the top of the railway car axle. The method used to lubricate the axle is to use waste, saturated with oil, placed in the journal box of each wheel. By "packing the box" and by frequent inspection, the carriers were able to keep relatively few the number of overheated journal boxes which were of disabling effect on the movement of trains. Notwithstanding all the efforts of the railways in this direction, many "hot boxes" occurred on trains en route, and this frequently resulted in the breakdowns and delays which were quite expensive to the carriers. Consequently, on all sides and for generations, there has been a continuing search by the railways and others interested in finding a way by which the overheated journal boxes could be detected before appreciable harm was done, and thereby facilitate and expedite the movement of railway traffic in this fast-moving age.

A method which, for all practical purposes, solves the problem has been developed, and it is on the question of whether the plaintiff, Servo, is entitled to credit for the result that this controversy arises.

This important action, the trial of which required some 33 days, plus some 4 days of helpful argument by able counsel, with 6541 pages of evidence and 733 exhibits, has been a strongly contested one, and happily, by agreement of the parties, the Court had the benefit of an outstanding

member of the bar of the Western District of Virginia, the Hon. R. S. Kime, to assist the Court as Special Master in the determination of the intricate, technical and difficult issues involved, who spent months in study and preparation of his report.

The service of the Special Master has been helpful in the study, sifting and correlation of the volumes of testimony and exhibits, thus lifting a load of detail work from the District Judge. However, the Court is conscious of its duty and judicial responsibility to decide the issues presented, and it was partly with that thought in mind that the Court sat with the Master throughout the proceedings in this case. To avoid influence on the thinking of the other, neither the Special Master nor the Court indicated to the other his thinking on the issues as the evidence was developed.

THE ISSUES

This action involves the question of the validity and infringement of three patents owned by Servo Corporation of America, namely:

(1) Patent No. 2,937,857, referred to as the '857 "Shutter" Patent;

(2) Patent No. 2,880,309, referred to as the '309 "Orientation" Patent;

and

(3) Patent No. 2,963,575, referred to as the '575 "Alarm" Patent.

(1) The '857 "Shutter" Patent

Special Master Kime, in his report, held the "Shutter" patent invalid for the reason that the results achieved

were obvious to and could be accomplished by one skilled in the are and that there was a lack of novelty or newness in his alleged invention.

No objections were made by Plaintiff, Servo, to this holding of the Master, and the Court agrees fully with and confirms the findings of the Special Master as to the invalidity of said '857 "Shutter" patent.

(2) The '309 "Orientation" Patent

This is the basic patent involved.

The Special Master, in his report, upheld the validity of the '309 "Orientation" patent as to claims in suit numbered 5, 6, 9, 10 and 11, and further found that defendant, General Electric Company, had infringed upon the rights of Servo in connection with said patent, and had copied it in the features essential for successful operation of a hot box detector.

General Electric defended as to the '309 "Orientation" patent on the grounds that the subject matter of the patent would have been obvious to a person having ordinary skill in the art; that it is invalid because of prior public use, sale and publication of its subject matter for more than one year prior to the disclosure of the subject matter to the patent office; that the patent does not disclose the best mode contemplated and known by the patentees for practicing the alleged invention, and that said patent was neither infringed nor copied.

In his finding as to the '309 "Orientation" patent, the Special Master says in his report:

> ". . . The claim of the inventors is that they were the first to construct an apparatus consisting of certain component parts housed in a sturdy metal box (physical models of both the Servo and G. E. detectors were filed as exhibits) to be mounted trackside, preferably on a metal, concrete or wooden base, in such a manner as not to be affected by

the passage of trains, looking upward and inward at such angles (in relation to the rails) so that the apparatus will view only the trailing (lateral) sides of passing journal boxes. Servo claims that it was the first to so construct and mount track-side, below the level of wheel axles, such a device so that its internal components would scan only journal boxes and register their temperature to the exclusion of all other heat sources that would otherwise tend to actuate false signals and that this was accomplished by using or taking advantage of the underside of the cars as a uniform reference background. This manner of mounting and pointing the apparatus is referred to as the 'toed-in' method which the inventors say is the crux of their invention.

"The body of the detector is composed of a heavy outer metal shell with a partial interior shell which, with its air space, tends to keep down the interior temperature of the box. Housed within the box is a lens, bolometer and an amplifier all electrically connected so that the device when mounted track-side and in operation can receive infrared heat waves from passing journal boxes. The metal shutter, which is the subject of the '857 patent, or 'Shutter' patent, and which the inventors claim acts not only as a protection to the delicate internal parts of the detector but as a reference background when the detector is not scanning, opens when the first wheel of the train passes over a magnetic transducer or wheel trip, whereupon, the device is made ready to receive heat signals from journal boxes so long as the train is in motion and as each successive wheel passes over the wheel trip the shutter stays open until a brief interval after the train's departure, whereupon, it automaticaly closes.

"Hundreds of pages of evidence are devoted to a detailed description of bolometers, lens, shutters, amplifiers and circuitry and the part each and all play in connection with hot box detectors. An almost equal number of pages deal with various types of wheel trips, mechanical, magnetic and electrical, the function of which is to open the protective shutter of the detector and while the train is in motion gate through to the recorder the heat signals from passing journal boxes. This gating is generally denominated as *time* gating, where the signal is of a fixed duration, or *space* gating, where the signal is gated through for a time space which is governed by the speed of the train. Space gating is generally accomplished by the use of two wheel trips or transducers.

"Both Servo and G. E. use in their equipment the 'thermistor bolometer' patented in the 1940's by Bell Telephone Laboratories but marketed by Western Electric, both being affiliates of the American Telephone and Telegraph Company — licenses to use such equipment having been granted to Servo and G. E.

"Plaintiff and defendant agree that the thermistor bolometer has aided greatly in the receptive diagnosis of infrared signals from heated metals, especially in the hot journal box field area. Servo is licensed to manufacture thermistor bolometers, which are extremely sensitive to infrared heat waves. These waves are passed on to the bolometer through a lens which is located in a tube or barrel in front of the bolometer. The function of the lens is to act as a filter so as to pass on to the bolometer only waves of a certain length; the infrared energy waves being in a range from about 2 to 12 microns.

"The lens problem was early found to be a most difficult one. Ordinary glass will not permit the passage of infrared energy waves. Various substances were experimented with and Servo came up with an arsenic trisulphide lens which it called 'Servofrax lens.' This proved to be the most satisfatcory type of lens for hot box detection purposes. When the shutter opens, the arsenic trisulphide lens permits the infrared energy waves to pass through to the thermistor bolometer, composed of two elements arranged in a bridge circuit. The active flake only of the bolometer receives the energy from the infrared waves causing it to change its resistance, with respect to the inactive element of the bolometer which, in turn, brings about a differential electrical output from the bridge. The amplifier then amplifies this voltage to a point where sufficient power is generated to make a recording on a tape or sound an alarm.

"Amplifiers are either of the D-C (direct current) or A-C (alternating current) type.

"It was soon learned that a D-C amplifier would not successfully function in a hot box detector other than possibly a laboratory model. G. E.'s expert, William D. Cockrell, admits this and Warshaw found this out in his 1949 experiments. The A-C amplifier is used by both Servo and G. E.

"The A-C amplifier has desirable operating characteristics in that its gain can be made uniform and it is substantially independent of power supply voltage variations, the smallest changes in which creates a drift problem in a D-C amplifier. When, however, an A-C amplifier is used in an instrument to scan hot journal boxes, it has the disadvantage of becoming saturated and thus fails to pass informative signals for a short period of time after the detector has viewed an extremely hot or cold

source, just prior to viewing the journal box (in this case the target). The experts for both Servo and G. E. agree on this.

"Benjamin Cooper, another of G. E.'s experts, testified that an A-C amplifier acted as though it had a memory recording the history of what happened previous to it, whereas, a D-C amplifier does not have a memory. The importance of this is of great significance in the practical application of the use of a thermistor bolometer in a hot box detector. If the bolometer is exposed to any source (other than a passing journal box), such as the sky, snow, reflections from a bright object, or an unfavorable background, from which infrared heat waves emanate, the bolometer will pass the signal through to the amplifier which may thus become saturated and a false signal or recording will result.* Servo claims that its orientation invention solves this most difficult problem by mounting its detector track-side below the level of passing journal boxes, angled upward and inward so that the bolometer, when not receiving heat waves from journal boxes, is focused on the underside of the passing cars, which provide a quiescent background, the ambient temperature remaining the same during the day or night, and throughout all seasons of the year, regardless of the direction of the movement of the train, and that the temperature of which, in relation to the journal boxes, can be accurately determined to the exclusion of other discordant heat sources so as to detect only overheater journal boxes. This Servo claims can be done, even without gating through the signal when otherwise only the journal box is in view. G. E. claims that orienting the detector is perfectly ob-

"* As will hereafter appear, G. E.'s electronic expert Cockrell insists the role that the amplifier plays is more important than the manner in which the detector is oriented."

vious, even to one unskilled in the art, and that this method, at least as to the mounting of the detector track side and angled upward, is disclosed by the prior art. G. E.'s experts and its counsel contend that the secret of successfully viewing overheated journal boxes resides in a combination of a proper filtering lens, a thermistor bolometer and a non saturating amplifier. The record contains no evidence that a non saturating amplifier is as yet available. G. E.'s Cockrell, . . . who admittedly is the father of G. E.'s hot box device, one of its top electronic engineers, and the publisher of a text book on 'Industrial Electronic Control' (later edited as an 'Industrial Electronic Handbook') when cross examined on the use of amplifiers, testified as follows: (R-4315-16)

'Q. So this was not important; the viewing angles were not important? A. So far as I am concerned, the viewing angle was not important then; it is not *extremely* (emphasis supplied) important now; except as a crutch for an infrared amplifier. If we had a perfect D-C amplifier, we would not worry at all about angles.

Q. Oh. well, do you have perfect D-C amplifier today? A. We do not.

Q. Oh, I see. So the use of this equipment so far as orientation and angles is concerned is to some extent limited by the fact that you had an A-C amplifier to work with, only? A. I am afraid that's a fact of life.'

"Again, (R-4450) when questioned by G. E.'s trial counsel, Cockrell said:

'. . . and I think the court will appreciate if we had an amplifier which would not saturate, which would not change its calibration over the days and we could then so gate that amplifier that

only the signal that came from the bolometer as we were looking at the journal—we would have an excellent output *with very little to bother from the outside influence* (emphasis supplied). Since we cannot have a perfect amplifier, we make the best we can and then use these various crutches for protection of the bolometer against strong outside light and that type of thing to assist it.'

"Cockrell characterizes the 'toe-in' viewing angle as one of the crutches. While constantly stressing the importance of the role the amplifier plays in the successful scanning of journal boxes, yet he is nevertheless forced to admit its present limitations which necessitates the use of his so-called 'crutches.'

"The thermistor bolometer is patented and used by both Servo and G. E. Servo asserts no inventive claims as to its arsenic trisulphide lens, likewise used by both. The A-C amplifier is an integral part of the equipment of each. None of these elements of the detectors of plaintiff and defendant, together with their electrical circuitry, are directly involved in Servo's invention claims relating to its 'orientation' '309 patent, other than they constitute essential components of the detector of each.

"The amplified output of the bolometer, which reflects changes in the infrared radiation which falls upon it, is employed by both parties to actuate pens of a recording galvanometer. These recordings are made on a tape. Detectors are mounted, one on either side of the tracks so that the temperature of each end of the axle can be read; thus, there are two lines produced on the paper tape of the recorder. Each line contains a series of pips, the height of the pips above the base line indicating the temperature of passing journal boxes.

There are several kinds of recorders. Sanborn recorders are standard equipment for both Servo and G. E. These recorders can be placed near the vicinity of the detectors or may be placed some distance away. In actual operation it is desirable to mount the detector trackside several miles beyond a railroad repair yard and transmit the signal to the recorder located within the yard. The tape is thus read at a point considerably in advance of the incoming train. An experienced operator can thus determine, from studying the tape, if there are overheated journal boxes on any of the cars. There is no contention on the part of either as to its right to make use of recorders.

"Those who sought to solve the hot box journal problem were faced with many perplexing difficulties. Aside from the selection, assembly and housing of the internal components of an apparatus designed to view journal boxes of passing trains, it was also necessary to take into consideration many factors such as: the type of journal bearings, whether friction or roller, the shape of the journal box,* the varying diameter of the wheels, the sway or motion of the train, as well as its speed, the portions of the journal box to be scanned, whether the lid, top, bottom, leading or trailing sides, the heat sources on the train, such as brake shoes, steam hoses, etc., and especially outside disturbing factors, the sun, clouds, snow, reflections and any unfavorable background. Added to all of this is the fact that railroads, of necessity, must make use of rugged and exacting equipment, designed to be utilized in an environment

"* Journal boxes housing roller bearings are generally smaller, more rounded, and do not protrude as far, measured from the end of the axle, as do friction journal boxes and hence proved more difficult to bring within the view of the scanner."

where utility and dependability are essential. While G. E. insists otherwise, there was no real breakthrough or solution of the problem until Servo's Gallagher and Pelino collaborated."

The Special Master details the conception of the '309 "Orientation" idea by Gallagher and Pelino of Servo in April, 1956, when they began "looking in such a manner as to get at the bottom of the car for this referencing and still sweep the journal and miss the remainder of the hot sources."

And the Special Master concluded:

> "The evidence clearly demonstrates that, despite G. E.'s insistence to the contrary, no one prior to the combined undertakings of Gallagher and Pelino had ever come up with a practicable or successful 'Hot Box Detector.'" (Master's Report, p. 24)

Further, the Master found :

> "I find from the evidence before me that Servo made a true break through in the hot journal box detection field and that there is novelty, utility and unobviousness in the discovery. As to utility, there can be no question. The defendant acknowledges this and, more importantly, substantiates it by manufacturing and selling hot box detectors embodying all the essential features of Servo's detectors. In fact, the vertical and toe-in viewing angles are almost identical. At the time of the trial, both Servo and G. E. had somewhat refined and standardized their products. In August, 1960, Servo had sold or leased some 200 detectors and G. E. approximately 117." (Master's Report, p. 26, 27)

Continuing, the Master said:

> "In standard practice Servo scans at a vertical angle of 25° and toed-in angle of 10°. G. E. scans at a verticle angle of 26° and an acute angle of 8°. Servo learned that in order to view all types of journal boxes and yet use the underside of the train as a reference background it was necessary to move its detector a little further from the rails and toe it in slightly—this, however, necessitated the lowering of the vertical angle. G. E. learned from Servo . . . and merely made a slight change in the two angles, producing however, the same result.
>
> "G. E. insists that claim 5 of Servo's patent '309' is indefinite and cannot be construed to embrace specific claim 6, which is referred to as the 'toe-in claim;' that claim 6 must stand or fall without the support of claim 5, which is not a generic claim, and that Servo had discovered the 'toe-in method' and employed it in detectors leased and sold to railroads more than one year prior to June 30, 1958, the filing date of its continuation in part application, based on its original parent patent application filed November 6, 1956. Further, G. E. insists that claim 6 of the 'Orientation' '389 patent is barred by virtue of the fact that Servo Publication SE-23 (DX 69) read in conjunction with a letter from Servo to the Virginian Railway Company, dated June 30, 1957, which G. E. claims is typical of similar letters sent to other railroads, described the toed-in form of the invention; and finally, G. E. relies on a publication in the Railway Age, dated July 1, 1957, but actually published—G. E. contends—before the date it bore." (Master Report, p. 28)

The Master, upon examination of claim 5 of the '309 "Orientation" patent, held that it was a broad and generic claim.

Essentially, the Special Master holds that the claim of the '309 "Orientation" patent covered the location of the detector along side a section of the track which would scan the journal box of the car at a proper vertical angle and a proper toed-in or acute angle which would successfully achieve the desired results of hot box detection; that this idea originated with Servo and that was picked up and adopted by G. E., with modifications, but retaining the important principle of orientation or mounting.

The Court adopts the findings of fact of the Special Master to the effect that Servo was the first to successfully put the essential elements of a detector together in a working combination and to find the proper location and the proper vertical and toed-in angles for the hot box detector, although the Court has some misgivings as to whether the idea was originally conceived by Servo.

Fattor in 1949 and in 1951 was striking close to the problem, but for financial reasons his ideas were not patented, nor was there sufficient publication of Fattor's work to affect the granting of the '309 patent to Servo. In fact, there is absence of proof that Servo know of Fattor's work.

Again, there is evidence of other investigation and experimental efforts (prior to Servo) directed toward solution of the problem, including the work of Warshaw (G. E.) in 1954, and various railway companies. But once the patent office, in face of all the prior art, granted the patent, the Court is met with the presumption that the patent is valid.

From the outset of the trial, it has been the Court's view that the controlling issue in this case is whether Servo, using the thermistor bolometer, magnetic wheel trips, shutters and other items necessary in combination to construct a hot box detector, was entitled to claim a valid patent by reason of it (Servo) being first to position the detector at a point where it would work successfully.

To the Court the preponderance of the evidence seems to support the conclusion of the Master that Servo was first in placing the detector alongside the track at a place where it would scan and record hot journal boxes, and where the detector would exclude undesirable signals and would view the journal box at the most desirable spot. As to this fundamental finding, the Court adopts the result of the report of the Special Master, notwithstanding the quaere which has perplexed the Court from the beginning of this trial, namely: Is the idea of location or positioning of the device a patentable one? In other words, is a position in space patentable? These misgivings on the part of the Court have been somewhat allayed by the admission of counsel for G. E. in the argument before the Court on exceptions to the Master's report—at which time counsel for G. E. (in answer to a question from the Court) expressed his view in the affirmative, with reservations as to circumstances.

The ingredients of the detectors were obvious to one skilled in the art, but it is the Court's view, as it was the Special Master's, that Servo was the first to conceive and put into successful operation the detector located at a viewing point that would achieve the desired result. By reason of the fact that Servo was the first to discover and put into successful practice the proper viewing position, the Court confirms and approves the Special Master's findings on the '309 "Orientation" patent, and therefore holds the '309 patent valid, and further that it was infringed by General Electric.

In so holding, the Court has considered carefully G. E.'s defense to the '309 patent, which defense is fourfold and in substance contends:

(1) that the subject matter of the patent would have been obvious to a person having ordinary skill in the art;

(2) that it is invalid because of prior public use, sale and publication of its subject matter for more than one year prior to the disclosure of the subject matter to the patent office;

(3) that the patent does not disclose the best mode contemplated and known by the patentees for practicing the alleged invention; and

(4) that said patent was neither infringed nor copied.

(1) Obviousness

In the argument of counsel for G. E., it was urged that obviousness was shown by the clearance requirements of the railways, and by the suggestions and work of McDonald, Pilcher (of the Norfolk and Western Railway), and Whitehead (of the Pennsylvania Railway).

One answer to the clearance argument is that there were places other than the Servo viewing point that would conform to clearance requirements and still fail to measure up as a successful hot box detector. Another thought is that one could have given up as hopeless the idea of making a workable detector in face of the rigid clearance requirements. A further observation is that although the railway clearance requirements were known to G. E. beforehand, G. E. did not adopt the Servo positioning until it knew from the Salisbury inspection the Servo "look".

As to Mr. Pilcher's contribution, the Court was impressed with his fairness as a witness, but at the same time, the Court must say that Mr. Pilcher was not positive and definite in his testimony as to where the idea of positioning came from. Mr. Pilcher's answer, "I think it came from me", is insufficient to prove, in face of all the other evidence, and reasonable inferences to be drawn therefrom, that it came from Mr. Pilcher.

Similarly, as to McDonald and Whitehead, the Court is unwilling to overturn the Master's findings by reason of

the alleged suggestions of Mr. Whitehead of the Pennsylvania Railroad or Mr. McDonald of Servo—bearing in mind that the District Court is controlled by the provisions of Rule 53(e)(II) which provides that the Court shall accept the Master's findings of fact unless clearly erroneous, as it is stated in *London* v. *Troitino Bros. Inc.*, 301 F. 2d 116 (1963).

The best answer to G. E.'s defense of obviousness is the cold fact that notwithstanding the great need for a successful hot box detector by the railway industry and notwithstanding the constant quest for a solution to the problem, it was not until Servo located the proper viewing position that the device became a practical answer. The problem of locating the detector at a point which would view the most favorable spot of the journal box on a moving car under changing conditions, taking into consideration other factors of heat, light and atmosphere obtaining, was a difficult problem to solve, and as before stated, Servo was the first to come up with a working answer. The Court does not feel that finding this answer was as simple as defendant urges, or that it possessed the obviousness referred to and described in the Patent Act, which would defeat it. (35 U.S.C. 103)

An excellent discussion on the test of obviousness applicable here comes from our own Fourth Circuit and is set fourth in *S. H. Kress & Co.* v. *Aghnides*, 246 F. 2d 718, and *Honolulu Oil Corp.* v. *Shelby Poultry Co.*, 293 F. 2d 127, *and Entron, Inc.* v. *Jarrold Electronics Corp.*, 295 F. 2d 670.

Prior Art

In this case there has been considerable evidence and discussion of prior art. The record embraces many pages of what was done by Canada, Warshaw, Orthuber, Johnson, Howell, Willey, The British Thompson-Houston Company, various railroads, and others in pursuit of the solution to the hot box detector problem. However, G. E.

in its objections to the Master's Report states that no contention is made that the '309 patent was anticipated by the prior art.

The position of G. E. is that the prior art is to be considered on the test of obviousness—in other words, that the accomplishments of the various persons working with the hot box detector problem prove that the subject matter of the '309 invention was obvious to others having ordinary skill in the art. The faulty premise is that these various inventors did not succeed. The Court, confronted with the presumption of validity of the patent granted by the patent office, does not feel that the test of obviousness has been overcome by G. E. Quite true, in retrospect the assemblage of the detector ingredients and placing the same in the right location to do the job now appear relatively simple to one of the ordinary skill in the art, but the test of the need and how long the need, the many efforts of trial and error, and the recognition of the invention as an answer, and the use by G. E. itself,* all add up to the

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* G. E. scans at an acute angle of 8°—Servo at an acute angle of 10°. G. E. scans at a vertical angle of 26°, whereas, Servo at 25°.

fact that it was not an invention obvious to one of the ordinary skill in the art.

• • • •

Counsel for the plaintiff has made citations of over one hundred decided cases and text references, and defendant has likewise made reference to many authorities on the legal problems presented. The Court has not undertaken in this opinion to discuss the various citations of counsel, but will say that out of the host of authorities cited no case is found which holds precisely that a position in space is patentable. The two cases which appear to strike closest to the point on the basic '309 patent are:

Eibel Process Co. v. *Minn. & Ontario Paper Co.*, 261 U.S. 45 (1923);

Drive-In Theatres v. *Park-In Theatres*, 174 F.2d 547.

In the *Eibel* case, the Court observed that the change of position was in the machine *itself* and was not a *position* in space. On this, Mr. Walker, chief counsel for defendant, responded, "I honestly don't think it is a distinguishing characteristic; in other words, in theory, I would say there is nothing which inherently disqualifies from patenting the selection of a position." (Tr. Argument p. 203-4). Confronted thus by this admission of counsel, coupled with the presumption of validity, and finding no authority to the contrary, the Court, for reasons stated herein, is upholding the '309 patent.

The *Theatre* case, although possessing similarities, is not sufficient to overthrow the Court's holding of validity for the '309 patent.

An order will be entered in accordance with this opinion.

TED DALTON.
United States District Judge

June 22, 1963.

Judgment of the District Court

This patent having come before the Court on defendant's Motion to Reject in Part the Master's Report and to Enter Judgment In Favor of Defendant and this Court having heard, read, and considered the pleadings, proofs, briefs and arguments submitted by the parties, together with the report of the Special Master and having rendered an opinion, filed herein, constituting its findings of fact and conclusions of law,

It is hereby ORDERED, ADJUDGED and DECREED as follows:

(1) Claims 5, 6, 9, 10 and 11 of the United States patent No. 2,880,309 are valid and are infringed by defendant's devices in suit and as to this conclusion of the Special Master, his report is approved and confirmed.

(2) Claims 3 and 4 of United States Reissue Patent (shutter) No. Re 24,933 are invalid and are not infringed by defendant's devices in suit which is the conclusion of the Special Master and his finding is approved and confirmed.

(3) Claims 3, 4, 5 and 20 of United States patent No. 2,963,575 are invalid and are not infringed by defendant's devices in suit. The Special Master found said claims valid and infringed and as to this finding said verdict is rejected.

(4) The Court as to unfair competition is dismissed.

(5) The count as to violation of the antitrust laws is dismissed.

(6) An injunction is hereby awarded as to United States Patent No. 2,880,309 enjoining and restraining defendant from further infringements upon said patent.

(7) The Court holds that the plaintiff is entitled to recover of defendant actual or compensatory damages for

infringement of said '309 patent, the amount of damages to be hereinafter determined upon a proper accounting, but punitive or increased damages is denied.

(8) This case is referred to Hayden Anderson, C.P.A., of the firm of Anderson & Reed, Roanoke, Virginia, for an accounting as to the damages sustained by plaintiff by reason of the infringement of the '309 patent by the defendant.

(9) The question of attorneys' fees is held in abeyance, although the Court at this stage of the proceedings does feel that this is the exceptional type of case in which counsel fees should be awarded to the successful litigant.

(10) Plaintiff shall recover its costs from defendant, to be hereinafter determined by the Court.

(11) Defendant, desiring to appeal from this judgment and plaintiff desiring to file a cross-appeal, the execution of this judgment is suspended for a period of thirty (30) days.

/s/ TED DALTON
United States District Judge

Dated: June 25, 1963

Report of Special Master

• • • •

The Problem

For a great many years railroads have been, and still are, plagued by "hot journal boxes" in railroad parlance "hot boxes." These occur primarily in connection with the operation of freight trains. Due to the advent of diesel engines, freight trains are made up of many more cars than formerly. The longer the freight train the more probable becomes the danger of a "hot box" developing. There are in the United States over 200,000 miles of main line tracks. Over these tracks thousands of trains operate daily, made up of cars differing considerably in their configuration. Nearly all freight cars—whether they be box cars, gondolas, coal hoppers, flat cars, refrigeration cars or tank cars—are equipped with friction bearings. Only a small percentage have roller bearings. The car body rests on trucks, each truck composed of a frame, springs, two axles and four wheels. Even the wheels vary in size, due to constant wear. The end of the axle (each end) protrudes through what is known as a journal box. The journal box houses a babbitt lined curved brass bearing that fits snugly over the top of the axle. This bearing is held in place by a metal wedge. The weight of the car rests on the bearing. The bottom of the journal box is concave and forms a recess below the axle which turns in the box.

The method employed for a great many years to lubricate the turning axle or journal was to place oil and oil saturated waste into this recess. This waste, or in railroad parlance termed "dope", was composed primarily of matted cotton threads—the cotton threads were found to retain their oil saturation qualities better than other kinds of thread. As the axle turned, the oil from the threads lubricated the bearing, reducing the friction between the bearing and the turning axle thus tending to stabilize the

temperature that otherwise would quickly build up in the journal box. In order to pack the journal box from time to time, as well as inspect it, the box is equipped with a large lid, generally made of iron and hinged at the top. Each car is thus equipped with two trucks, with springs, four axles, eight wheels and eight journal boxes. On account of the structure of the truck frame not as much of the trailing (rear) side of the forward journal box is exposed as is the case with following journal box. The importance of this relates to the width area of the lateral (back) sides of the forward and trailing journal boxes that are exposed to scanning when the scanner or detector is mounted track-side below the level of the train axle in a manner so as to view the journal boxes while the train is going away from the detector. This method of scanning is now being used by both Servo and G. E.

The railroads have long been faced with two problems relative to hot boxes—one to prevent them—the other to detect them—before damage is done. While G. E. rather insists that the Association of American Railroads (known as the A.A.R.) and to which most of the primary railroads of this nation belong, centered its attention on finding ways to prevent the occurrence of hot boxes, yet the record discloses that no progress of any consequence was made toward the solution. As testified to by the witness Pilcher (Engineer of Tests, Norfolk & Western Railroad), experiments were made with various oils, and oil pads were adopted (R-1038-42) some eight years ago by the Norfolk & Western and now are almost exclusively used by most railroads. These pads simply stay in place better than the waste but do little to prevent the occurrence of hot journal boxes. Although overheated journal boxes causing, in many instances, the end of the axle journal to be wrung off, resulting in serious train wrecks, costing the railroads of the country hundreds of thousands of dollars, continue to take place with greater frequency due to longer and speedier trains, nothing (other than the time

honored method of manual inspection) was accomplished toward their prevention. The problem of detection remained foremost.

G. E. further takes the position that the railroads in the late 1940's and early 50's were not receptive to the idea of detection through the medium of various suggested devices and would not lend their support and cooperation, especially in a financial way, to the solution of the problem. In fact, G. E. stresses the point that it could have solved the problem in connection with its experiments in this field in 1952 through 1955 but insists the railroads were not ready to be convinced and, for this reason, its business management called a halt in all further operations in this field. This was disclosed and, in fact, emphasized in the deposition testimony of Dr. Louis T. Rader, who stated he was "General Manager, Specialty Control Department, Industrial Electronics Division, G. E." Defendant, on page 73 of its opening brief, quotes from Dr. Rader's testimony to this effect. In fact, the brief makes the outright statement that G. E. elected at that time not to offer a hot box detector on the commercial market for business reasons and "not because of any inability to cope with any techinacl problems." This statement is almost inconceivable in view of the fact, as the record amply discloses, G. E. had been urged by the Chesapeake & Ohio Railway Company to furnish it the necessary equipment required to make a trial installation "at some point on our road." The request was also for all engineering information and approximate cost of equipment to make the trial installation. This was in May, 1953, and involved the same railroad that several years later became one of the proving grounds for the Servo equipment. Other than an exchange of communications, in which G. E. stated it was engaged in working on the problem, nothing in the nature of a practicable working device (although G. E. denies this) was produced. The Chesapeake & Ohio Railroad was disappointed and G. E. ceased its endeavors, still insisting that the railroads were not yet receptive.

While the evidence does disclose that the railroads were reluctant to financially underwrite a venture into the production of hot box detectors—this being so because of the many so-called successful solutions proposed and submitted—primarily to the Association of American Railroads, which for various and sundry reasons were found to be impracticable and discarded, yet there were railroads like the Chesapeake & Ohio that were willing and anxious to test equipment that might offer a solution of a costly and aggravating problem. Conferences and communications between G. E. and the Chesapeake & Ohio commenced in April, 1953, and finally terminated with the letter of September 16, 1954 (PX41) wherein G. E. stated to the Chesapeake & Ohio, in substance, that its laboratory had completed its development program and was ready to "produce preproduction samples" and concluding:

"Frankly, the financial backing required for further testing has not been aproved by the company. I have conveyed to them how anxious the railroads are for a device of this type and ask that they do everything possible to proceed with these developments."

This was before Servo became a serious contender in the field of the development of a "hot box detector." Despite the repeated assertions of G. E. to the contrary, at least some of the railroads were, before 1955, seriously and intently interested in any device that could in some practicable manner indicate hot journal boxes on freight cars.

Before taking up the patents, I desire to point out that it is somewhat regrettable, in view of the complexity and volume of the testimony and the great number of exhibits filed, that the presentation of the case as a whole did not follow a more integrated and logical course. In point of time there was no fixed continuity, either as to the presentation of oral testimony or the filing of exhibits. For this, at least in part, the Court and Master were somewhat responsible in their efforts to keep the case moving.

All will agree, however, that each had his full day in court.

The Patents and the State of the Prior Art

The basic patent is the '309, or "Orientation" patent which will be first dealt with. The claim of the inventors is that they were the first to construct an apparatus consisting of certain component parts housed in a sturdy metal box (physical models of both the Servo and G. E. detectors were filed as exhibits) to be mounted trackside, preferably on a metal, concrete or wooden base, in such a manner as not to be affected by the passage of trains, looking upward and inward at such angles (in relation to the rails) so that the apparatus will view only the trailing (lateral) sides of passing journal boxes. Servo claims that it was the first to so construct and mount trackside, below the level of wheel axles, such a device so that its internal components would scan only journal boxes and register their temperature to the exclusion of all other heat sources that would otherwise tend to actuate false signals and that this was accomplished by using or taking advantage of the underside of the cars as a uniform reference background. This manner of mounting and pointing the apparatus is referred to as the "toed-in" method which the inventors say is the crux of their invention.

The body of the detector is composed of a heavy outer metal shell with a partial interior shell which, with its air space, tends to keep down the interior temperature of the box. Housed within the box is a lens, bolometer and an amplifier all electrically connected so that the device when mounted trackside and in operation can receive infrared heat waves from passing journal boxes. The metal shuter, which is the subject of the '857 patent, or "Shutter" patent, and which the inventors claim acts not only as a protection to the delicate internal parts of the detector

but as a reference background when the detector is not scanning, opens when the first wheel of the train passes over a magnetic transducer or wheel trip, whereupon, the device is made ready to receive heat signals from journal boxes as long as the train is in motion and as each successive wheel passes over the wheel trip the shutter stays open until a brief interval after the train's departure, whereupon, it automatically closes.

Hundreds of pages of evidence are devoted to a detailed description of bolometers, lens, shutters, amplifiers and circuitry and the part each and all play in connection with hot box detectors. An almost equal number of pages deal with various types of wheel trips, mechanical, magnetic and electrical, the funtion of which is to open the protective shutter of the detector and while the train is in motion gate through to the recorder the heat signals from passing journal boxes. This gating is generally denominated as *time* gating, where the signal is of a fixed duration, or *space* gating, where the signal is gated through for a time space which is governed by the speed of the train. Space gating is generally accomplished by the use of two wheel trips or transducers.

Both Servo and G. E. use in their equipment the "thermistor bolometer" patented in the 1940's by Bell Telephone Laboratories but marketed by Western Electric, both being affiliates of the American Telephone and Telegraph Company—licenses to use such equipment having been granted to Servo and G. E.

Plaintiff and defendant agree that the thermistor bolometer has aided greatly in the receptive diagnosis of infrared signals from heated metals, especially in the hot journal box field area. Servo is licensed to manufacture thermistor bolometers, which are extremely sensitive to infrared heat waves. These waves are passed on to the bolometer through a lens which is located in a tube or barrel in front of the bolometer. The function of the lens

is to act as a filter so as to pass on to the bolometer only waves of a certain length; the infrared energy waves being in a range from about 2 to 12 microns.

The lens problem was early found to be a most difficult one. Ordinary glass will not permit the passage of infrared energy waves. Various substances were experimented with and Servo came up with an arsenic trisulphide lens which it called "Servofrax lens." This proved to be the most satisfactory type of lens for hot box detection purposes. When the shutter opens, the arsenic trisulphide lens permits the infrared energy waves to pass through to the thermistor bolometer, composed of two elements arranged in a bridge circuit. The active flake only of the bolometer receives the energy from the infrared waves causing it to change its resistance, with respect to the inactive element of the bolometer which, in turn, brings about a differential electrical output from the bridge. The amplifier then amplifies this voltage to a point where sufficient power is generated to make a recording on a tape or sound an alarm.

Amplifiers are either of the D-C (direct current) or A-C (alternating current) type.

It was soon learned that a D-C amplifier would not successfully function in a hot box detector other than possibly a laboratory model. G. E.'s expert, William D. Cockrell, admits this and Warshaw found this out in his 1949 experiments. The A-C amplifier is used by both Servo and G. E.

The A-C amplifier has desirable operating characteristicts in that its gain can be made uniform and it is substantially independent of power supply voltage variations, the smallest changes in which creates a drift problem in a D-C amplifier. When, however, an A-C amplifier is used in an instrument to scan hot journal boxes, it has the disadvantage of becoming saturated and thus fails to pass informative signals for a short period of time after the detector has viewed an extremely hot or cold

source, just prior to viewing the journal box (in this case the target). The experts for both Servo and G. E. agree on this.

Benjamin Cooper, another of G. E.'s experts, testified that an A-C amplifier acted as though it had a memory recording the history of what happened previous to it, whereas, a D-C amplifier does not have a memory. The importance of this is of great significance in the practical application of the use of a thermistor bolometer in a hot box detector. If the bolometer is exposed to any source (other than a passing journal box), such as the sky, snow, reflections from a bright object, or an unfavorable background, from which infrared heat waves emanate, the bolometer will pass the signal through to the amplifier which may thus became satuated and a false signal or recording will result.* Servo claims that its orientation invention solves this most difficult problem by mounting its detector track-side below the level of passing journal boxes, angled upward and inward so that the bolometer, when not receiving heat waves from journal boxes, is focused on the underside of the passing cars, which provide a quiescent background, the ambient temperature remaining the same during the day or night, and throughout all seasons of the year, regardless of the direction of the movement of the train, and that the temperature of which, in relation to the journal boxes, can be accurately determined to the exclusion of other discordant heat sources so as to detect only overheated journal boxes. This Servo claims can be done, even without gating through the signal when otherwise only the journal box is in view. G. E. claims that orienting the detector is perfectly obvious, even to one unskilled in the art, and that this method, at least as to the mounting of the detector track side and angled upward, is disclosed

* As will hereafter appear, G. E.'s electronic expert Cockrell insists the role that the amplifier plays is more important than the manner in which the detector is oriented.

by the prior art. G. E.'s experts and its counsel contend that the secret of successfully viewing overheated journal boxes resides in a combination of a proper filtering lens, a thermistor bolometer and a non saturating amplifier. The record contains no evidence that a non saturating amplifier is as yet available. G. E.'s Cockrell, (whose evidence will be referred to a number of times in this report) who admittedly is the father of G. E.'s hot box device, one of its top electronic engineers, and the publisher of a text book on "Industrial Electronic Control" (later edited as an "Industrial Electronic Handbook") when cross examined on the use of amplifiers, testified as follows: (R-4315-16)

"Q. So this was not important; the viewing angles were not important? A. So far as I am concerned, the viewing angle was not important then; it is not *extremely* (emphasis supplied) important now; except as a crutch for an infrared amplifier. If we had a perfect D-C amplifier, we would not worry at all about angles.

Q. Oh, well, do you have perfect D-C amplifiers today? A. We do not.

Q. Oh, I see. So the use of this equipment so far as orientation and angles is concerned is to some extent limited by the fact that you had an A-C amplifier to work with, only? A. I am afraid that's a fact of life."

Again, (R-4450) when questioned by G. E.'s trial counsel, Cockrell said:

> " . . . and I think the court will appreciate if we had an amplifier which would not saturate, which would not change its calibration over the days and we could then so gate that amplifier that only the signal that came from the bolometer as we were looking at the journal—we would have an excellent output *with very little to bother from the outside influence* (emphasis supplied). Since we cannot

have a perfect amplifier, we make the best we can and then use these various crutches for protection of the bolometer against strong outside light and that type of thing to assist it."

Cockrell characterizes the "toe-in" viewing angle as one of the crutches. While constantly stressing the importance of the role the amplifier plays in the successful scanning of journal boxes, yet he is nevertheless forced to admit its present limitations which necessitates the use of his so-called "crutches."

The thermistor bolometer is patented and used by both Servo and G. E. Servo asserts no inventive claims as to its arsenic trisulphide lens, likewise used by both. The A-C amplifier is an integral part of the equipment of each. None of these elements of the detectors of plaintiff and defendant, together with their electrical circuitry, are directly involved in Servo's invention claims relating to its "orientation" '309 patent, other than they constitute essential components of the detector of each.

The amplified output of the bolometer, which reflects changes in the infrared radiation which falls upon it, is employed by both parites to actuate pens of a recording galvanometer. These recordings are made on a tape. Detectors are mounted, one on either side of the tracks so that the temperature of each end of the axle can be read; thus, there are two lines produced on the paper tape of the recorder. Each line contains a series of pips, the height of the pips above the base line indicating the temperature of passing journal boxes. There are several kinds of recorders. Sanborn recorders are standard equipment for both Servo and G. E. These recorders can be placed near the vicinity of the detectors or may be placed some distance away. In actual operation it is desirable to mount the detector trackside several miles beyond a railroad repair yard and transmit the signal to the

recorder located within the yard. The tape is thus read at a point considerably in advance of the incoming train. An experienced operator can thus determine, from studying the tape, if there are overheated journal boxes on any of the cars. There is no contention on the part of either as to its right to make use of recorders.

Those who sought to solve the hot box journal problem were faced with many perplexing difficulties. Aside from the selection, assembly and housing of the internal components of an apparatus designed to view journal boxes of passing trains, it was also necessary to take into consideration many factors such as: the type of journal bearings, whether friction or roller, the shape of the journal box,* the varying diameter of the wheels, the sway or motion of the train, as well as its speed, the portions of the journal box to be scanned, whether the lid, top, bottom, leading or trailing sides, the heat sources on the train, such as brake shoes, steam hoses, etc., and especially outside disturbing factors, the sun, clouds, snow, reflections and any unfavorable background. Added to all of this is the fact that railroads, of necessity, must make use of rugged and exacting equipment, designed to be utilized in an environment where utility and dependability are essential. While G. E. insists otherwise, there was no real break-through or solution of the problem until Servo's Gallagher and Pelino collaborated.

The Conception

Cornelius A. Gallagher, one of the two inventors in the '309 or "Orientation" patent, was on the stand for the greater part of some six days, during which time he was subjected to an extended and elaborate cross examination. I deem it fair to say that all who heard him were im-

* Journal boxes housing roller bearings are generally smaller, more rounded, and do not protrude as far, measured from the end of the axle, as do friction journal boxes and hence proved more difficult to bring within the view of the scanner.

pressed with his candor and with the forthright manner in which he answered questions without equivocation.

Gallagher (R-2939 et seq.) begins the explanation of his and William M. Pelino's conception of how to view railroad journal boxes so as to eliminate false, unwanted and disturbing signals, as follows:

> ". . . we were sitting down one day and I had the *Car Builders Cyclopedia* in front of me as we were discussing the problem and we were reviewing the failures that my circuit had encountered on not being able to get a *true ambient reference* (emphasis supplied), and we had more or less discarded the shuttering idea as being a mechanical difficulty. We had gone through the possibilities of germanium shutters and then in this—in this discussion, and while we were sitting there it dawned upon one of us that in order to deal with the problem of a train or car in, say, Maine, in a difficult winter condition and a train in Texas where it is warm, you would have to have something that would give you a standard of comparison because heat is a difficult thing to put in a standard condition. We were looking there—I don't know whether it was triggered off by looking at the book, but it occurred to us that the car was always in the environment of the target and subjected to the same conditions, whether it be in winter or summer. We might have gone off on the tangent of thinking how we could use the car as a reference in other manners, as taking radiation from it and developing voltages, and things like that, but then one of us in looking at the *Car Builders* Manual noticed a darkened area under the car. That seemed to be a good place. It is out of the sun and there is no snow there, and we began considering the feasibility of looking at the bottom section of the car, and not putting all

of your heat sources of hot brake shoes and hot wheel rims; and it went rather rapidly from that point on to where we would consider *looking in such a manner as to get at the bottom of the car for this referencing and still sweep the journal and miss the remainder of the hot sources.* (Emphasis supplied).

This alternately was the arrival at the idea of putting it down on the ties and looking up. From that point, I recollect that I marked in the encyclopedia the angle by putting a protractor and drawing a line on it. This constitutes my recollection of how it happened."

This occurred during the latter part of April, 1956. Prior to this, Sabert N. Howell, a Servo engineer, had conducted many experiments, some under the direction of Joseph F. McDonald, also of Servo, who was in charge of the hot box problem, until approximately the end of April, 1956.

McDonald, in March, 1956, before the Gallagher and Pelino conception, and after a great deal of development work, which failed to produce a successful scanner—although Howell did secure certain patents—best summed up the requirements as follows: (PX - 348)

"The hot box detective to be practicable must single out an overheated journal box from all normally heated targets that will come into view *day or night, winter or summer,* on rail lines running *to all points of the compass.*"

The evidence clearly demonstrates that, despite G. E.'s insistence to the contrary, no one prior to the combined undertakings of Gallagher and Pelino had ever come up with a practicable or successful "Hot Box Detector."

Following their conception, Gallagher and Pelino, over the ensuing weeks, proceeded to put into practice their ideas, first on the Long Island Railroad and, a little later, on the New York, New Haven and Hartford. These tests, especially on the New Haven, were made by using a bolometer, Servofrax lens (mounted in an adjustable focusing barrel) and a stock amplifier—Servo was manufacturing amplifiers. The tripod was discarded and shock mounted angle brackets were used to protect the equipment from vibration. The brackets were fastened down on the ties with screws.

Gallagher testified (R - 2949)—

"Q. I see. So the reason of the shock mounts had something to do with the fact that this was a new location; is that correct? A. It is due to the vibration in the environment in which we mounted the unit.

Q. You say this is the first time you mounted it in this environment? A. It's the first time it was ever subjected to the vibration of the ties, and the trains moved very fast.

Q. By 'this environment' you mean on the ties? A. Physically on the ties."

As to the vertical angle first used, Gallagher (R - 2952) testified on direct examination:

"Q. I notice your angle of view, then was about 45 degrees? A. I think that might be a typographical error, because it was 35 degrees, between 30 and 35.

Q. What is it now? A. Well the first time we installed it, installed it to a railroad, it was 35 degrees; and then around March or April, we made the toe-in changes which toed it in 10 degrees, and then we eventually lowered it to 25; so the present orientation is 10 degrees toed in and 25 in the vertical angle.

By the Master:

Q. Now, when you spoke of when you toed it in, you were not talking, then, of 1956? A. No, that's 1957."

From then on, Gallagher, the co-inventor of the "orientation" patent '309, and who also testified at great length, during which he was subjected to a grueling cross-examination, conducted many experiments. It was at Oak Point on the New Haven that they first encountered a problem with roller bearings and noted that large amplitude pulses on roller bearings were occurring—something that up to then, they had never encountered.

On June 25, 1956, the inventors noted their disclosure, and on November 6, 1956, filed their parent patent application which gave rise to a division in part of the patent known as the "Shutter" patent '857, issued May 9, 1961, and a continuation in part application filed June 30, 1958, resulting in the issuance of the "Orientation" '309 patent March 31, 1959.

The "disclosure" (PX 384) sets forth:

> "Shutters are completely eliminated by the plan of figure 2. The pyrometers see only the journal boxes and *the underside of the car overhang which is nearly at ambient temperature.*" (Emphasis supplied).

In experimentations in the hot box field it was early discovered that due to the tendency of the bolometer to pass through to the amplifier false signals (those not emanating from journal boxes) it was necessary to build into the scanner some reference background that the bolometer would be looking at when not viewing journal boxes. Shutters were tried and attempts were made to so synchronize the shutter blades, with reference to passing journal boxes, as not to allow the bolometer to see anything but the back of the turning blades except when a journal box came in view. Due to the varying speeds of trains and the synchronizing problems, shuttering proved impracticable. Servo discovered another way to eliminate this most troublesome of all scanning prob-

lems. The underside of the car Servo found to be under all conditions, winter or summer, day or night, near ambient temperature, thus furnishing a much sought and desirable reference background and, for the first time, so mounted its scanning device as to take full advantage of this discovery.

I find from the evidence before me that Servo made a true break through in the hot journal box detection field and that there is novelty, utility and unobviousness in the discovery. As to utility, there can be no question. The defendant acknowledges this and, more importantly, substantiates it (as will hereafter appear) by manufacturing and selling hot box detectors embodying all the essential features of Servo's detectors. In fact, the vertical and toe-in viewing angles are almost identical. At the time of the trial, both Servo and G. E. had somewhat refined and standardized their products. In August, 1960, Servo had sold or leased some 200 detectors and G. E. approximately 117.

Servo's Progress and Contentions as to Claims 5 and 6 of "Orientation" Patent '309

I consider Servo's Exhibit 360 as being of particular importance, as it shows in graphic form the early Servo Breadboard Model viewing experiments, thence continuing down through its Lot No. 1 model. The various railroads, dates and actual viewing time reduced to hours, are assembled on one sheet. The drawing includes the angles employed, both vertical and acute, giving dates of changes made in angles and including drawings of side and end-on configurations of a flat car, hopper car, gondola, box car and tank car with outlines and dimensions of wheels, and journal boxes, both friction and roller bearing. The approximate percentages of the various types of cars are given as they are normally used in railroad transporta-

tion. This word picture brings into focus some of the difficult problems that beset the would be inventor of a practical and successful hot box detector. It also emphasizes the necessity for experimentation before a final determination could be made as to the establishment of vertical and acute angles of such a character as would eliminate false signals passed to the detector when scanning certain types of railroad cars—more especially unloaded flat cars and tank cars not equipped with catwalks.

In standard practice Servo scans at a vertical angle of 25° and toed-in angle of 10°. G. E. scans at a vertical angle of 26° and an acute angle of 8°. Servo learned that in order to view all types of journal boxes and yet use the underside of the train as a reference background it was necessary to move its detector a little further from the rails and toe it in slightly—this, however, necessitated the lowering of the vertical angle. G. E. learned from Servo (discussed under the head of Infringement) and merely made a slight change in the two angles, producing however, the same result.

G. E. insists that claim 5 of Servo's patent '309 is indefinite and cannot be construed to embrace specific claim 6, which is referred to as the "toe-in claim"; that claim 6 must stand or fall without the support of claim 5, which is not a generic claim, and that Servo had discovered the "toe-in method" and employed it in detectors leased and sold to railroads more than one year prior to June 30, 1958, the filing date of its continuation in part application, based on its original parent patent application filed November 6, 1956. Further, G. E. insists that claim 6 of the "Orientation" '309 patent is barred by virtue of the fact that Servo Publication SB-23 (DX 69) read in conjunction with a letter from Servo to the Virginian Railway Company, dated June 30, 1957, which G. E. claims is typical of similar letters sent to other railroads, described the toed-in form of the invention; and, finally,

G. E. relies on a publication in the Railway Age, dated July 1, 1957, but actually published—G. E. contends—before the date it bore.

I will first examine the status of claim 5 of the "Orientation" '309 patent. I consider this a broad or generic claim. Much space in both the evidence and briefs is devoted to the discussion of the aspects of claim 5 and its relative merits. Mr. Yung Kwai, a former employee of the Patent Office, testified as to the character of claims 5 and 6. Portions of his testimony are quoted in the briefs of Servo and G. E. I first advert to the file wrapper of the Gallagher and Pelino application, Serial No. 620,703 (PX-14) filed November 6, 1956. On page 3, the inventors, in describing their invention, say:

> "Briefly stated, our invention contemplates an improved hot box detector of the variety in which a heat-responsive cell or element is fixedly mounted alongside a section of track to be monitored. Optics continuously image the cell in the plane of passing journal boxes and *on an axis inclined generally upward* from beneath the passing boxes. The vertical plane which includes the viewing axis is *preferably substantially parallel* to the track, so that the viewing of brake shoes, steam hose connections and the like can be avoided * * * As best shown in fig. 2, the viewing axis 16 slopes upward at an acute angle, which is preferably of the order of 20 to 50 degrees from the horizontal, and is aligned to observe the part of the journal box body which projects outwardly of the side frame 20; we have obtained very satisfactory results when the viewing angle is approximately 35 degrees in the vertical plane which parallels the adjacent track 13.
>
> It is to be noted that since the car frame 19 overhangs the journal box 18, *the viewing aspect 16 is*

such as to establish a more or less quiescent background level response of cell 14." (Emphasis supplied).

Claim 1 of the original application states:

"A hot box detecting device, comprising * * *, and optics imaging said heat responsive means along an upwardly inclined axis, and in substantially the plane of passing journal boxes."

Claim 2 states:

"A hot box detector * * *, said axis being substantially in a vertical plane that is parallel to the adjacent track section."

Claim 3 states:

"A hot box detector according to claim 2, in which said upwardly inclined axis is at an angle extending from the horizontal, in the range 20 degrees to 50 degrees."

Claim 4 states:

"A hot box detector according to claim 2, in which said upwardly inclined axis is at an angle of substantially 35 degrees from the horizontal."

As to the vertical angle, both the parent application, as well as the '309 issued patent, specify a viewing angle in the range of 20 to 50 degrees. Both also specify an angle of "substantially 35 degrees." Claim 4 in the application stating "from the horizontal;" Claim 5 in the patent concluding "above the general plane of the rails of said track"—each means the same thing. It is to be noted that 35° is exactly midway in the angle range of from 20 to 50 degrees. As has been pointed out, G. E. uses a ver-

tical angle of 26 degrees. Servo's vertical angle is 25 degrees. Both are within the range of 20 to 50 degrees specified in the parent application and in the patent. When the language "preferably" 35° was inserted in the patent it is plain that Servo did not thereby intend to limit the angle to 35°.

As the so-called "acute angle" is relative to the longitudinal direction of the track, which gave rise to the expression "slant aspect viewing," G. E., in substance, maintains that this change amounts to a new invention and that such was not embodied within the substance of the original claims. With this I do not agree.

Original "Claim 4" did not specify any angle relative to the direction of the track except an upward angle. The inventors, it is true, in describing their invention speak of the vertical plane which includes the viewing axis as "preferably substantially parallel" to the track but this plainly does not mean "parallel" to the track. The Patent Office required the language "generally in the longitudinal direction of the track," or rail, to be inserted in the claims of the issued patent. While admittedly this may be broader language than "substantially parallel", yet it does not materially change the intended meaning of the claims set forth in the original application. As a matter of fact, original Claim 5 was not so limited.

While both parties in their briefs (and especially in their reply briefs) dwell upon this at some length, I am of the opinion that they have, in giving it undue emphasis, overlooked the essential ingredient of the invention. This was the discovery of the fact that using the tools at hand, a device could be made and so oriented as to successfully scan and record only hot journal boxes, to the exclusion of all unwanted and disturbing signals and this could be done by taking advantage of the fact that the underside of the cars provided a uniform reference background.

While still insisting throughout its briefs that filtering lens and amplifiers are the keys to successful scanning—which assertions are not substantiated by the evidence, as no perfect filtering lens has, as yet, been produced, nor has there been manufactured a non saturating amplifier—G. E. (RB-34) grudgingly concedes some measure of success to the use of the underside of the car as a uniform reference background by stating:

> "It is only common sense that any shielding from the sun afforded by the shade of the cars is helpful to some degree, and it is only common sense for the designer to avail himself of it, but as we have just shown, Servo goes much too far in claiming that the underside of the cars serve as a quiescent background . . . * * *.
>
> In this general position, the skewed line of sight has two advantages. One is the geometry of it partially offsets side sway. No point of this was made in the '309 patent, and the desirability of it is obvious. The other advantage is that in so far as the filtering system is inadequate, the skewed angle is needed to get rid of some of the exposure to extraneous sky and sun."

Reluctant as counsel for G. E. may be to accord any merit to the Servo method of scanning, here we have an admission (1) of the fact that the "shade of the cars" (which, of course, constitutes a reference background) is helpful in some degree; and (2) that the "skewed line of sight" is needed to get rid of some of the exposure to extraneous sky and sun. Thus, counsel for G. E. confirms the conclusion reached by its expert William D. Cockell (Page 19 of this report) that while the viewing angle is not *extremely* (emphasis supplied) important, except as a crutch for an infrared amplifier, yet, without the crutch, the successful scanning of hot journal boxes would remain

the unsolved problem that it was prior to the collaboration of Gallagher and Pelino.

The "Orientation" '309 patent has the characteristics of a "pioneer" patent. If it does not rise to the full dignity of such, it certainly constituted a major break through in its field. It received wide acclaim, even while still in its experimental stage.

* * * *

The opening briefs of the parties deal extensively with the prior art but there is no well defined segregation of its treatment. The reply briefs, especially that of counsel for G. E., constitutes largely a rehash of what was said before. A veritable mass of testimony and exhibits were assembled dealing with this phase of the case. Experimentations and partial accomplishments are intertwined with mere suggestions, the origin and extent of which remain in the realm of doubt.

Any discussion of the prior art will involve the obviousness or unobviousness of the patents in suit, especially the "Orientation" '309 patent. In its initial statement of the case, counsel for G. E., in his opening brief, devotes pages 6 through 13 to a series of general statements, the import of which is to the effect that there is nothing to the orientation claims in suit, nor to the gating methods hereinabove described. That to place the detector device down on the tracks and look upward was perfectly obvious. The short answer to this is that of the many experts, versed in the art, who tackled the problem, none solved it prior to Gallagher and Pelino. What, with a backward look, now seems obvious, then, with a forward look, remained elusive. A few even reached the conclusion that the task was almost impossible. The maintenance and signal departments of the railroads, as well as committees appointed by the "Association of American Railroads" (A.A.R.) had received many suggestions and had tested some devices but none afforded a solution.

This, no doubt, accounts in part for the "must be shown" attitude of the railroads and emphasized the necessity of centering attention upon the problem of finding ways to prevent the occurrence of hot journal boxes rather than to detect them. However, as heretofore pointed out, diesel engines replaced steam engines, enabling longer freight trains to be made up and hauled greater distances at faster speeds. This brought the problem of hot journal box detection back into focus, as means had not been found to prevent the occurrence of overheated journal boxes. To stop a freight train of from 150 to 200 cars, in order to manually search for a hot box, was a costly operation. The evidence clearly indicates the railroads were anxious and ready to lease or purchase and experiment with any device that presented what might appear to be a practicable solution.

(a)

"FATTOR"

At the outset of the case G. E. relied, to a considerable extent, on the work by an engineer by the name of A. P. Fattor as prior art anticipatory of Gallagher and Pelino. As the suit progressed, and after the taking of Fattor's deposition, it was urged that the "Servo Slant Aspect View" was obvious and that Fattors' I and II proposals were teaching publications which disclosed the viewing angles of the orientation patent. It is apparent from a close inspection of the text and drawings of "Fattors' electronic hot box detector" (PX 121 and DX 24) that Fattor, who styled himself a chemical engineer, holding a Masters Degree in physics (and a former employee of the Denver, Rio Grande and Western Railroad) was well versed in the use of bolometers, thermocouples and thermopiles and had experimented with them in recording the heat from journal boxes. The record is not clear as to the extent of his knowledge of filtering lenses or amplifiers. He tes-

tified that he conceived the idea of scanning journal boxes in 1945 and actually filed an application for a patent in 1949, which was later abandoned. His application embraced the viewing or scanning features disclosed in what is referred to in the record as "Fattor I." This represents a detector mounted at cross-tie level and pointed directly upward at a 90° angle ostensibly viewing the bottom of a journal box.

Upon submission of his material to the hot box committee of the A.A.R. he was advised (1) that the bottom of a journal box was not the proper place to record the temperature;* (2) that his constructional features were questionable, as the drawing disclosed a mounting fixed directly to the ties; and (3) that before any technical claims as to the speed and efficiency of the bolometer could be verified, a test unit would have to be made and these factors determined. Fattor's I disclosure did not teach, in any respect, the embodiments of Claims 5 and 6 of the "Orientation" '309 patent.

After considering these criticisms, Fattor then submitted to the A.A.R. hot box committee a new proposal (Fattor II) with drawings outlining certain test procedures relative to viewing at an angle so as to scan the trailing side of a journal box. This new proposal, which was based upon ideas not his own, stated:

> "I now propose to set the detector at an angle such that an area of the journal box *extending from its top surface to and including the bottom surface* will be scanned by the detector. This arrangement will provide greater sensitivity to journal

* The bottom of a journal box is concave and holds the oil and saturated oil pads or waste and a journal box could well reach a dangerously high temperature before the detector would record this, viewing only the bottom of the box. Tests on the Pennsylvania Railroad had disclosed that only 5% of the heat from the journal box goes directly down through the oil reservoir and pads, 7% goes to the lid cover, 23% travels up into the top of the journal box cover and 55% goes back through the axle into the wheel.

bearing temperature because of the close proximity of the top of the journal box to the heated bearing. Also such an arrangement permits a longer scanning time of each passing journal box. Figure 3 was prepared to show how infrared radiation of a hot wheel or brake shoe will be excluded from the scanning range of detector, this being made possible by employing a *limiting slit* through which the rays enter the detector. *Figure 1 shows a test set-up that may be used* in the overall evaluation of the detector. In the following pages, a test procedure referred to the test assembly is discussed, each of the effects being discussed separately." (Emphasis supplied).

In both the Servo and G. E. detectors the scan is from the bottom to the top as the train is in motion away from the detector.

In describing his proposed procedure, Fattor suggests mounting the detector "so that it may *be placed at all angles* thereby permitting all areas of the journal box to be scanned." At another place he says: "the detector will be made to scan the journal box both from the position indicated *or from any other angle* to facilitate the accumulation of data for all areas of the journal box." (Emphasis supplied).

As I see it, Fattor's suggested ideas for scanning journal boxes could be characterized as purely "shot gun" ideas. This could not be urged as a teaching anticipatory of the viewing or scanning angles described in Servo's "Orientation" '309 patent. This conclusion cannot be dissipated by merely stating that having suggested the viewing of a railroad journal box from "all" angles there only remained the manual task of carrying this out. Fattor never, at any time, made a detector, nor apparently did he ever attempt to make one. He submitted, from time to time, his ideas to "The Committee on Devel-

opment of Hot Box Alarm Devices" (later changed to "The Committee on Hot Box Alarm Devices") of the A.A.R. and requested this committee not to assist him in conducting experiments with any existing hot box detecting device, but to financially underwrite the construction of a scanner so it could then be experimented with. The committee requested him to submit a working model for testing, and even suggested that if after further study it was the consensus of the committee that the principle had sufficient merit, from a practical and economical standpoint, to warrant development work, it could perhaps be handled as a budget item through the recommendation of the committee. A subcommittee was even appointed to pursue the matter further, should Fattor come up with any working device. Fattor not only failed to follow the suggestion of the committee (which had already told him, in substance, that he did not know where to look in his, Fattor I, disclosure) as to the construction of a working model but also never followed through with an application for a patent embracing the ideas he had incorporated into his Fattor II disclosure.

Upon the taking of his deposition, Fattor was presented with ample opportunity to elaborate upon and explain his ideas relative to scanning journal boxes. This he failed to do. Fattor, (R-1268) in explaining the test drawing sent to the A.A.R., in response to a question as to where he would locate a detector said:

> ". . . I wanted to prove, by means of tests, *which would be the optimum position* for this infrared detector, in order to eliminate all these other means that may bring about failure to the detector. That was the purpose of submitting the drawing, to determine this optimum position of the angle, for example, and this I *knew was very important, to have the hot box scanned in such a position that it give maximum response to the bolometer* or to the

infrared detector, *whatever it may be.*" (Emphasis supplied).

To me this is no teaching that could form the basis upon which one skilled in the art could construct a successful and practicable hot box detector. Furthermore, (R-1269) continuing—when asked whether it was his suggestion that instead of placing it on the ties, it be placed below the ties, he said:

> "A. That was one suggestion I made. Another suggestion I made was to put it off to the side, and, by means of a lens system, to have it eliminate these various things through optics of the device."

When an attempt was made to follow this up, he refused to divulge any information as to how this was to be accomplished. Here Fattor has injected into the picture the idea that if one had a perfect filtering lens, possibly, even with the use of an A-C amplifier, detectors mounted at track level or below could be eliminated and scanning could be successfully accomplished on a horizontal plane. I agree with the conclusion stated in a footnote in defendant's brief (DB-38) that "Fattor was a witness who, on deposition, was reluctant and unsatisfactory from the view point of both sides."

The evidence is not clear as to whether there was in fact any publication, within the meaning of the statute, of Fattor's disclosures to the A.A.R. Certainly this is true as to his second disclosure. The defendant has not, in this respect, borne the burden cast upon it. It is, however, on the other hand, almost a certainty that no one connected with Servo ever heard of Fattor and the disclosure of his ideas prior to the actual filing by Gallagher and Pelino, on June 30, 1958, of their application (as a continuation in part of the application for the parent patent) on which the "Orientation" '309 patent issued. In fact,

there is no evidence that G. E. or any other would-be inventor of a hot box detector was aware of the existence of Fattor.

Canada, Warshaw, Orthuber, Johanson, Howell, Willey and Others, as Prior Art

Following Fattor, many instances of prior art are stressed by G. E. In the briefs the discussions of this prior art are not well coordinated. It will not be my purpose to comment upon each separate work or undertaking, nor necessarily to treat with them in any logical sequence as to point of time. In many instances there is an overlapping.

The British Thompson-Houston Company (B.T.H.), an English affiliate of G. E., engaged in some experimental hot box detection work in 1950-51. This work was primarily confined to testing an infrared detector, mounted track side, in a subway tunnel. The viewing angle appears to have been directed 30° toward the rear of the train and 20° downward. While commercially it was never adopted, yet it is significant that G. E., before beginning its experimental work, had the advantage of the B.T.H. findings and reports.

G. E.'s Alfred H. Canada, an acknowledged specialist in the infrared and bolometer fields, collaborated with Howard Warshaw in undertaking to develop a practical hot box scanner. Their work extended over a period of several years and culminated in the granting of a patent to Warshaw, issued October 14, 1958, on an application filed December 30, 1954. When a consideration of the construction of a detector was under discussion it was called by Canada "a pioneer development" undertaking. Both Canada and Warshaw, although they had the data collected by their English affiliate B.T.H., had the use of

thermistor bolometers, had journal box temperatures supplied by the Pennsylvania Railroad and others and had the use of filters, never succeeded in solving the problem.

Warshaw's two reports—the first filed in January and the second in June, of 1954—reflect the progress made and the difficulties encountered. The scanning view employed initially by Warshaw was trackside, pedestal mounted, viewing the top of the journal box at a downward angle of approximately 12°. This proved to be unsatisfactory due to variations in truck-frames and box covers. Also the body structure of "gondola" cars made it almost impossible to employ this method; consequently, the viewing angle was changed so as to view passing journal boxes at a 45° angle to the rail. The scan path, which is shown in Figure 6, page 53 of plaintiff's brief, passes across the top of the lid near its hinge point thence across the top of the trailing side of the journal box. The Warshaw scan path is not at all similar or to be compared with Servo's. Warshaw never made any claim to a reference background. In fact, due to the variations in wheel diameters, and sizes and configurations of journal boxes, the Warshaw scan path is not as practical or desirable as is Servo's. Suffice it to say that although G. E. owns the Warshaw patent, it does not make use of its features, nor has it ever done so on a commercial basis. Canada fully recognized the problems to be overcome or circumvented and he summed it all up in a sentence—

> ". . . we were aiming at simply a device that, without tripping at particular times could operate on trackside twenty-four hours a day, turned on *and only see hot journal boxes go by.*" (Emphasis supplied).

Neither he nor Warshaw achieved success, although it is readily conceded that each was certainly an expert in the hot journal box field.

Actually, before Canada and Warshaw had ceased their efforts to construct a practical scanner, G. E. had what it called a Better Business Management Training group (B.B.M.) also trying to solve the riddle. The accomplishments of this study group added nothing by way of a solution. It was the same old thing—we can scan a hot box but we are unable to scan out extraneous heat sources. G. E. insists its Warshaw work and B.B.M. findings were successful but that the "economic squeeze" was the reason why commercial devices were not constructed. Aside from the fact that G. E. should be one of the last to place its self in the position of the "impecunious Fattor", as counself has described the gentleman, the evidence refutes the claim that the railroads were not vitally interested in hot box detection equipment and ready to test it. G. E. cannot urge this as either a reason why it ceased temporarily its efforts to develop a successful scanner or failed to appropriate money for what it claims would have turned out to be a commercial device. The urgent requests from the C. & O. Railroad for even test equipment, to which I have heretofore called attention, completely nullifies such an assertion. G. E. is correct in insisting that it had then, and has now, the engineering and technical know how and financial ability to tackle almost any electronic problem and in the vast majority of cases, no doubt, solve it, but success did not reward the efforts of its personnel. The obvious was unobvious to G. E. Should there be any doubt as to whether the Warshaw, or B.B.M. product for that matter, would have turned out to be a commercial success, G. E.'s expert Cockrell in his direct examination, after he had already given a rather involved and inconclusive answer to a question as to why he did not consider building a detector designed substantially like the Warshaw or B.B.M. product, said: (R-4366)

"Q. This then would not be a commercial device that you would offer to a railroad or something of that sort; is that correct? A. That is correct."

On October 14, 1958, there was granted a patent to the International Telephone and Telegraph Company on an application dated January 25, 1954. This is known as the "Orthuber" patent and variously referred to as "Farnsworth", "Federal Telephone and Radio" (FTR) or "I. T. & T." due to their connection with the patent. The detector was mounted on a pedestal, journal box height, and scanned at a 90° angle on a horizontal plane. It employed a mechanical shutter as a background for each journal reading.

G. E. holds a license under this patent and insists that it incorporates gating of the same type employed by G. E.—a gating actuated by a variable reluctance pick up. This is denied by Servo. Granted, however, that this is one of the kinds of gating covered by the Servo "Orientation" '309 patent, nevertheless, Servo only asserts the protection of its claim, in this respect, when this form of gating is used in connection with the Servo's slant aspect viewing.

An Orthuber detctor was tried out on the Erie Railroad during the last two months of 1956 and in January 1957. It broke down and failed to function on numerous occasions and was finally removed. G. E. claims it could have been a success but, if so, the proof of this assertion is entirely lacking. The Orthuber or Farnsworth device used a shutter as an internal reference background. Shutters have been tried many times but in the whole range of evidence there is no recorded instance where a mechanical shutter proved satisfactory. In this method of operation there is no similarity between Servo and Orthuber. F. Youngwerth, General Superintendent of Communications and Signals of the Erie Railroad, in a letter to G. C. White, Vice President of Operation and Maintenance, Erie, in September 1958, in commenting upon the information he had received from other railroads as to the excellent results they had experienced in using Servo detectors, made the following comparison: (PX-216)

> "This to say the least, is remarkable when compared with results we experienced with Federal Telephone & Radio Corpn. detector. (Orthuber or Farnsworth) at North Judson."

The United States "Johanson" patent issued December 31, 1957, on an application filed January 26, 1955, and the German "Johannson" patent published March 29, 1956, are cited as prior art. Neither of these patents teach an external reference background or an orientation method of viewing journal boxes. The United States Johanson patent views journal box lids on a horizontal plane. The German Johannson patent discloses a detector mounted between the rails, inclined vertically upward, viewing car axles. Each make of a detector uses an internal reference background of the nature of a chopper blade.

Finally, G. E. relies on the early experimental work of Servo (before the teaming of Gallagher and Pelino) as prior art teaching, beginning with Howell, Dergano and Willey, and extending down to March 1, 1956, when Pelino became associated with Servo. It seems strange that G. E., in its briefs, stresses its contention that it had pioneered in a search for a method to detect overheated journal boxes, whereas, Servo entered the field a number of years later when the railroads were becoming more receptive to new ideas and new equipment yet, at the same time insisting that the early exertions on the part of Servo personnel actually brought the search for a solution down to the point that constituted a teaching which was merely followed or carried out by Gallagher and Pelino. As to Servo, I do not find either contention to be in accordance with the evidence.

Defendant, in its brief (DB-80) points out that in December, 1952, as a result of Servo's advertisement of infrared measuring equipment, an inquiry was received by Servo

from the Baltimore & Ohio Railroad. In April, 1953, (G. E. continues) as a result of "some preliminary thinking" on the part of Howell, Derganc and Willey, Servo made application for a patent which G. E. adds was never issued, although it included the Gallagher-Pelino basic essentials of an infrared detector. This reasoning is unclear, for the purpose stated; however, it does prove (1) that in 1952 the B. & O. Railroad was interested in a hot box detector device and (2) that Servo, which also possessed considerable knowledge as to the possibilities of infrared, thermistor bolometers and viewing lenses, was very much engrossed in the problem.

In October, 1953, R. J. Berti, Assistant Electrical Engineer for the Union Pacific Railroad, also contacted Servo, as did the Southern, shortly thereafter. The Hycon Manufacturing Co. was also contacted by T. L. Carlson, General Superintendent of Signaling and Communications of the C. & O. Railroad Company, (and an important witness in the case) in October, 1955, in regard to the availability of a hot box detector. I cite this further instance not because Hycon Manufacturing Co. ever developed any device worthwhile (it was just another company trying to develop a successful scanning device) but to emphasize again the fact that the railroads were turning to every source that appeared to offer a solution.

The Norfolk & Western Railway was another interested road. That G. E. abandoned the field in 1955 and did not reenter it until March or April, 1958, after Servo was in the process of demonstrating that it had produced a product of real merit, was not because the railroads were not receptive but because G. E. had failed in its efforts to make a practicable railroad hot journal box scanning device.

Servo's search for a solution to this vexing railroad problem continued down through various experiments and proposals made to the B. & O. Railroad, the Union Pacific Railroad and to the Association of American Rail-

roads, culminating in Sabert N. Howell's (a Servo engineer) patent No. 2,829,267 on an application filed June 14, 1955, and the Willey patent No. 2,970,210 on an application of June 27, 1955. Neither of these prior patents teach the principles, or embodiments of the "Orientation" '309 patent. Both were pedestal mounted detectors, their viewing planes being horizontal to the track and directed to the lid of passing journal boxes.

It is urged that the Howell patent disclosed the features of the "Shutter" patent, (yet to be discussed) but in passing, it should be noted that the shutter in this patent was located between the lens and the detecting bolometer, and not in front of the lens.

Neither of these patents even remotely teach the slant view aspect viewing of the "Orientation" '309 patent.

* * * *

I find nothing in the prior art cited that would constitute a sufficient teaching to enable one skilled in the art, to construct a hot journal box detector embodying the features and claims of the "Orientation" '309 patent. With the exception of Fattor, the Patent Office had the benefit of and examined practically all of the prior art of any consequence. Burnham Yung Kwai, who for forty-one years had been on the examing staff of the United States Patent Office, in answer to a question with regard to how extensive a search had been made as to the '309 patent, stated: (R-3962)

*"A. Well, the examiner in these cases made searches in 13 classes and interviewed examiners in other divisions. He cited in this particular case 19 references. He had the benefit of the attorney's search in the petition to make special. Consequently, he covered the railway signal art, he covered the radiation art, he covered electrical circuit, measuring and testing, and other things. So he

* The witness estimated that he had spent (R-3932) about six days examining the file wrappers.

made a rather extensive search and had quite a few more than the normal number of references before him."

The "Orientation" '309 patent did not just sail through the Patent Office in a routine manner, as intimated by G. E. In the words of Yung Kwai, the patent had a rather rough time, as is disclosed by an examination of the file wrapper (PX 11 (a)).

On cross examination as to why the claims were first rejected and then allowed, Yung Kwai testified: (R-4028)

"Q. Can you tell me why he first rejected them and then later allowed them.

A. That is normal procedure. The examiner rejects the claim if he thinks it is unpatentable over the art he has. He then gets a reply from the attorney and if from the attorney's reply, or if from his own study of the disclosure, he finds that the claim indicates novelty, utility and something that is unobvious to a man ordinarily skilled in the art at the time the application was filed, he should have allowed the claim. That is what he is taught and that is what he does."

Now to put it in other words, the examiner in this case found novelty in the claim because he did not have a single reference to meet. He found it useful and he said that early.

In order to have the third requisite of patentability, unobviousness to a man skilled in the art, the yardstick used is if the novelty and the claim produces an improved new and unexpected result or some advantage, then the claim is allowed.

Now he, using that process, found out from the attorney's office and from his study of the specification that there was a useful and new result here, so he abandoned his references and allowed the claim."

The "Orientation" '309 patent stands aloof unanticipated by the prior art. It measures up to the tests that are

given expression to in *S. H. Kress & Co.* v. *Aghnides*, 246 F. 2d 718 (C.A. 4, 1957); *Honolulu Oil Corp.* v. *Shelby Poultry Co.*, 293 F. 2d 127 (C.A. 4, 1961); and *Diamond Rubber Co.* v. *Consolidated Rubber Tire Co.*, 220 U.S. 428 (1911).

The defendant further has failed to rebut the presumption of validity that flows from the action of the Patent Office in granting the patent after a consideration of numerous prior patents: *Chesapeake & Ohio Ry.* v. *Kaltenbach*, 95 Fed. 2d 801 (C.A. 4, 1938); *Manville Boiler Co., Inc.* v. *Columbia Boiler Co., Inc.*, 269 Fed. 2d 600 (C.A. 4, 1959) and *Power Curbers, Inc.* v. *E. D. Etnyre & Co.*, 132 U.S. P.Q. 158, (C.A. 4, 1962).

* * * *

CONCLUSION

For the reasons hereinbefore set forth, I recommend that judgment be entered containing the following provisions:

1. United States Patent No. 2,880,309, herein referred to as the "Orientation" '309 patent, is valid as to the claims in suit numbered 5, 6, 9, 10 and 11.

2. United States Reissue Patent No. 24,983, herein referred to as the 'Shutter" '857 patent, is invalid.

3. United States Patent No. 2,963,575, herein referred to as the "Alarm" patent, is valid as to claims in suit numbered 3, 4, 5 and 20.

4. The manufacture, use, sale and installation of tie-mounted detectors, by the General Electric Company, infringes the above identified claims in U. S. Patents No. 2,880,309, and specifically the sale to

the Erie Railroad of a tie-mounted detector, without G. E.'s peak reading, infringes claims in U. S. Patent No. 2,880,309 and Claim 20 in U. S. Patent No. 2,963,575 and the sales to the Texas and New Orleans and the Southern Pacific infringe the claims in both patents.

5. Defendant, General Electric Company, has competed unfairly with Servo and has been unjustly enriched by gaining access to and utilizing portions of Servo's detailed engineering data in the construction of General Electric Company's tie-mounted detectors, wherefore, Servo is entitled to an accounting for the value of such data.

6. Defendant, General Electric Company, be enjoined from further acts of infringement.

7. Defendant's counterclaims for a declaratory judgment of invalidity and non-infringement of patents in suit be dismissed as to United States Patents Nos. 2,880,309 and 2,963,575.

8. An accounting for damages be had but the determination of increased compensatory damages and attorneys' fees be postponed until the time of the accounting, to be resolved by the court.

Respectfully submitted:

R. S. KIME,
Special Master

October 17, 1962

Constitutional and Statutory Provisions

Constitution—Art. I, Sec. 8, Clause 8—

> "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

Patent Act of 1952—35 U.S.C. Sec. 103—

> "Conditions for patentability; non-obvious subject matter.
>
> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

Federal Rules of Civil Procedure, Rule 52(a)—

> "Findings of the Court.
>
> (a) Effect. In all actions tried upon the facts without a jury or with an advisory jury, the court shall find the facts specially and state separately its conclusions of law thereon and direct the entry of the appropriate judgment; and in granting or refusing interlocutory injunctions the court shall similarly set forth the findings of fact and conclusions of law which constitute the grounds of its action. Requests for findings are not necessary for purposes of review. Findings of fact shall not be set aside unless clearly

erroneous, and due regard shall be given to the opportunity of the trial court to judge of the credibility of the witnesses. The findings of a master, to the extent that the court adopts them, shall be considered as the findings of the court. If an opinion or memorandum of decision is filed, it will be sufficient if the findings of fact and conclusions of law appear therein. Findings of fact and conclusions of law are unnecessary on decisions of motions under Rules 12 or 56 or any other motion except as provided in Rule 41(b).

Servo Corp.'s Petition for Rehearing*

The Gravamen of the Petition

The position upon which this petition is based is:

That this Court predicated its application of the standard of invention upon the rationalization that the "answer is not contingent upon resolving conflicting testimony as basic facts are not seriously in dispute". Yet the recital of facts by this Court of Appeals is directly contrary to the specific findings made by the triers of fact below with respect to the objective criteria followed in testing the claims of a patent against the requirements set forth in the statute relating to non-obvious subject matter, namely, (a) the existence of a problem and a need for solution, (b) how many skilled workers unsuccesfully attempted to find an answer, (c) despite the availability of the means for solution in the surrounding arts, and (d) the recognition of the invention of the patent by the industry as an answer to the problem.

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* Servo Corp.'s Petition for Rehearing is printed in full in pp. 90-142 of Vol. XIII of the certified transcript of record and pertinent portions thereof are reprinted in this Appendix for the convenience of the Court.

This Court, before it applies a rule of law to a set of facts different from the set of facts found by the trial court and the master, must specifically find by its own analysis of the record, that such findings were "clearly erroneous". Based upon our knowledge of this record we believe this presents an impossible challenge for this Court of Appeals, and one which its opinion of September 30, 1964 reflects it accordingly did not undertake to accept.

Instead, this Court in applying the standard of invention set forth in Sec. 103 improperly did so in a subjective and independent manner directly contrary to (a) the facts as found by the District Court? (b) the facts as found by the Master and confirmed by the District Court and (c) the facts as they overwhelmingly exist in the record, all of which very plainly established the existence of these objective criteria in this case.

Accordingly, if this Court reached the same conclusion of obviousness by applying the test of invention to the facts as they were found below and as they can be demonstrated to have overwhelmingly existed in the record, this decision would be directly contrary to the widely understood principles underlying the rationale of decision heretofore established over a long period of time in this Circuit in cases such as *Lever Bros Co.* v. *Proctor & Gamble Mfg. Co.*, 139 F. 2d 633, (C.A. 4, 1943); *Florence Mayo Nuway Co.* v. *Hardy*, 168 F. 2d 778 (C.A. 4, 1948); *Colgate-Palmolive Co.* v. *Carter Products*, 230 F. 2d 855 (C.A. 4, 1956); *S. H. Kress & Co.* v. *Agnides*, 246 F. 2d 718 (C.A. 4, 1957); *Otto* v. *Koppers Company*, 246 F. 2d 505 (C.A. 2, 1960); *Manville Boiler Co.* v. *Columbia Boiler Co.*, 269 F. 2d 600 (C.A. 4, 1959); *Honolulu Oil Corp.* v. *Shelby Poultry Co.*, 293 F. 2d 127 (C.A. 4, 1961); and *Entron* v. *Jerrold Electronics Corporation*, 275 F. 2d 670 (C.A. 4, 1961). The District Court and the master specifically relied upon these cases and thus applied the proper rule

of law with respect to invention *but* they applied it to a different set of facts, facts which they, as the triers of fact found.

In substance, the plaintiff-appellee believes that the manner in which the judicial determination by this Court was made and the *modus* of judicial analysis reflected therein, mistakenly led to an incorrect and severly unjust result. The plaintiff-appellee itself would agree with the application of the rule of law embodying the standard of invention *to the facts as they were stated by the Court.* However, when this Court sets forth facts which, in significant respects, do not appear of record, are technologically incorrect, are directly contrary to the findings of fact of the District Court and the master, and to some extent reflect the acceptance of unsupported assertions contained in the appellant's brief, it departs from the proper rule of decision heretofore set forth by the Fourth Circuit Court of Appeals and commits substantial error as a court of review.

This Court, relying upon *Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp.,* 340 U.S. 147 (1950), stated that it:

> "• • • simply hold[s] that the standard of invention as applied by the Master and the District Court is not up to the legal standard required by the governing statute, 35 U.S.C.A. §103."

There is, and can be, no quarrel with the application of the statute to the facts as they were recited by the Court of Appeals. However, what the Court has misapprehended is that it has not applied the legal standard to the facts of record or the facts as found by the master and the District Court. Nor has the Court determined these facts to be clearly erroneous, a necessary condition precedent, as a matter of law, to the Court's determination.

• • • •

The Existence of the Problem and Need for Solution

This Court stated: *"Nor do we think Servo's argument that the railroads had long sought a solution to the problem will bear analysis."* • • •

The master, on the other hand, found: *"The railroads have long been faced with two problems relative to hot boxes—one to prevent them—the other to detect them—before damage is done.*[3] • • • *The problem of detection remained foremost."*[4] Again, with respect to detection the master found: "• • • *There were railroads like the Chesapeake & Ohio that were willing and anxious to test equipment that might offer a solution of a costly and aggravating problem."*[5] The master also found: *"the record amply discloses, G.E. had been urged by the Chesapeake & Ohio Railway Company to furnish it the necessary equipment*[6] • • •. Despite the repeated assertions *of G.E. to the contrary at least some of the railroads were, before 1955, seriously and intently interested in any device that could in some practicable manner indicate hot journal boxes on freight cars."*[7]

The District Court, which saw and heard witnesses on this subject, found, contrary to this Court: *"Consequently on all sides and for generations there has been a continuing search by the railways and others interested in finding a way by which the overheated journal boxes could be detected before appreciable harm was done."*[8]

Exempletive of some of the record evidence supporting such findings is the following. The witness, Peronto, Secretary of the Association of American Railroads stated: *"Well, the matter of detecting hot-boxes has always been a problem for the railroads in times past."*[9] The defendant's own expert, Alfred Canada, said: *"All railroads*

[3 etc. The record references in support of the Petition as indicated by numerals are identified at pp. A -A , *infra*, of this appendix.]

are faced with the problem of detecting hot boxes on rolling stock, in particular, the Chesapeake & Ohio Railroad Company is interested in obtaining equipment for this purpose. Also, the PRR and NYC Companies have indicated considerable interest in such equipment."[10] The unpublished and not reduced to practice prior art reference relied upon by the Court for another purpose, Fattor, states in 1949, six years before the conception of the invention in suit: *"The problem of finding ways to detect the presence of hot boxes on railway cars and advising the engineer of their presence has been recognized for many years."*[11] Again, a letter from the defendant itself to the Chesapeake & Ohio Railroad, advising of G.E.'s abandonment of research on a hot-box detector states that the writer had advised the G.E. laboratory in 1954 of the demand for a *detector,* two years before plaintiff's invention: *"I have conveyed to them how anxious the railroads are for a device of this type* * * *."*[12]

* * * *

The Unsuccessful Search for a Solution by Those Skilled in the Art and Their Failure to Perceive What This Court Subjectively Holds to Be Obvious

Perhaps the most perplexing aspect of this Court's decision is its statements that *"what Servo had done here is to ascertain the optimum conditions for use of the hot-box detector"*[21] and that this *"objective was discoverable by experiment."*[22] The Court then stated: *"Thus the act of Servo in taking one of the known positions disclosed by the prior art and moving the device outwardly from the rails so as to accommodate the geometry of the truck frames of railroad cars was not invention, this modification was an ordinary engineering matter obvious to one skilled in the art."*[23] The perplexity arises when one considers the Court's statement on unfair competition: *"It is also clear*

from the record that General Electric ceased its activities in the hot box detector field near the close of the year 1955. At that time its experimental department reported the infrared detection of hot journal boxes feasible but involving some difficult problems in practical application."[24] * * * *"General Electric learned that which it needed to know through Southern and both parties knew that their concerted activities were in violation of the confidence reposed in Southern by Servo."*[25]

These statements logically present the question, if the G.E. Company had engaged in a period of experiment; concluded that there were "difficult problems" involved; abandoned its activities; and then, later, learned what it "needed to know" from a physical inspection of the orientation of the Servo device, how can this Court but entertain some doubt about the validity of its subjective finding on the question of invention, namely, that the "objective was discoverable by experiment" and that it was "an ordinary engineering matter"?

A careful reading of the opinion of the Court of Appeals reveals that it did not at all discuss this second criteria. There is no reference to whether there was a search for a solution to the problem of hot box detection and no reference to whether such search did or did not produce a successful solution. A fair reading of the opinion of the Court of Appeals leads to the conclusion that it assumed that there were actually operative prior art devices as a basis for its findings that the invention was simply a minor improvement.

For example, the Court found: *"Though the patent in question is entitled a hot box detector, it correctly acknowledges the earlier development* by others of infrared heat-*

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* This statement is in fact the fulcrum upon which the Court of Appeals lends reality and significance to the prior art. Yet, we think that this Court, upon further reflection, will agree that this statement is plainly incorrect. The patent application very discretely refers to hot-box detectors earlier "disclosed". This obvi-

sensitive apparatus capable of sensing the temperature of moving objects, including the journal boxes of railroad cars."[26] The Court of Appeals also found that the invention of the patent "*merely performed the same function [as the prior art] more efficiently*".[27]

The master however, distinctly found that: "* * * *of the many experts, versed in the art, who tackled the problem, none solved it prior to*"[28] the invention of the patent in suit. He specifically found: "*A few even reached the conclusion that the task was almost impossible*".[29]

The master found with respect to the Fattor disclosure, relied upon by this Court as prior art sufficiently substantial to make obvious the invention of the patent in suit, that: "* * * *Fattor's suggested ideas for scanning journal boxes could be characterized purely as 'shotgun' ideas.* * * * *This conclusion cannot be dissipated by merely stating that having suggested the viewing of a railroad journal box from 'all' angles, there only remained the manual task*

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ously refers to printed or published matter. It does not, and cannot, by any show of reason, be interpreted to mean "developed" or operable devices. There is absolutely no justification for construing the language of the application to constitute an acknowledgment or admission of earlier "development" of any infrared hot-box detector on the basis of the language "disclosed". The plain fact is that the quoted statement above in the text is a word-for-word reproduction of argument contained in defendant's brief at page 3 thereof. We opine that this is hardly a basis for breathing life into abandoned, inoperable, and unsuccessful devices and treating them, in measuring the invention in suit, as though they were not, as the record really shows, residents of a "boneyard of failures and abandoned experiments". This Court had before it the record in this case and it cannot do otherwise but acknowledge as the triers of fact below found, not by inference, but by reliance on all the testimony, that not one of the prior art devices was ever commercially adopted or even shown to have successfully detected a hot-box in regular railroad operation. The entire collection of prior art in this case is plainly subject to the wise and practical observation made by a great judge of this circuit, Judge Parker, when he stated: "Patents for useful inventions ought not be invalidated and held for naught because of such excursions into the boneyard of failures and abandoned experiments." *Reynolds et al.* v. *Whitin Mach. Works*, 167 F.2d 78, 84 (C.A. 4, 1948) cert. den. 334 U.S. 884.

of carrying this out. Fattor never, at any time, made a detector nor apparently did he ever attempt to make one."[30]

The next relevant prior art work involves that of the defendant, the General Electric Company itself. A British associate of G.E. tested an infrared detector utilizing a heat-sensitive element in 1950-51. The master found: "• • • *Commercially, it was never adopted."*[31] The next work was that of two scientists at G.E., Canada and Warshaw. The master specifically found as a fact: "• • • *although they had the data collected by their English affiliate B.T.H., had the use of thermistor bolometers, had journal box temperatures supplied by the Pennsylvania Railroad and others and had the use of filters, never succeeded in solving the problem"*,[32] and that: *"Neither he [Canada] nor Warshaw achieved success, although it is readily conceded that each was certainly an expert in the hot journal box field."*[33] He quoted with respect to the result of this prior work, from the testimony of G.E.'s expert as follows: *"Q. This then would not be a commercial device that you would offer to a railroad or something of that sort; is that correct? A. That is correct."*[34]

The next relevant work was that of another large technically competent company, the International Telephone and Telegraph Company. The master specifically found with respect to this device, which is the prior art reference in evidence known as Orthuber, that: *"An Orthuber detector was tried out on the Erie Railroad during the last two months of 1956 and in January 1957. It broke down and failed to function on numerous occasions and was finally removed."*[35]

The District Court specifically confirmed these findings of the master and found: "• • • *it is the Court's view, as it was the Special Master's, that Servo was the first to conceive and put into successful operation the detector located at a viewing point that would achieve the desired*

result."[36] And the Court further significantly found: *"The best answer to G.E.'s defense of obviousness is the cold fact that notwithstanding the great need for a successful hot box detector by the railway industry and notwithstanding the constant quest for a solution to the problem, it was not until Servo located the proper viewing position that the device became a practical answer. The problem of locating the detector at a point which would view the most favorable spot of the journal box on a moving car under changing conditions, taking into consideration other factors of heat, light and atmosphere obtaining, was a difficult problem to solve, and as before stated, Servo was the first to come up with a working answer."*[37]

* * * *

Availability of the Means for Solution in the Surrounding Arts

This Court found that: "* * * *the possible solution did not exist until the pyrometer was developed in the 1950's.*[68] The Court also found: "* * * *thermistor bolometers were made available in about 1950".*[69] These findings led this Court to conclude that the necessary means for *"The possible solution"*[70] were not available in the surrounding arts and hence this third objective criteria does not exist in this case as evidence of invention.

This finding is, again contrary to that of the master who found:

> "* * * the discovery of the fact that using the tools at hand, a device could be made and so oriented as to successfully scan and record only hot journal boxes, to the exclusion of all unwanted and disturbing signals, and this could be done by taking advantage of the fact that the underside of the cars provided a uniform reference background."[71]

The District Court also recognized the existence of the individual elements and their availability to one skilled in the art, stating: *"The ingredients of the detector were obvious to one skilled in the art".*[72]

The record on this subject is, once again, directly contrary to the findings made by the Court of Appeals and it substantially supports the findings of the master and the District Court.

The record shows that the thermistor bolometer heat-sensing device was known to workers in the infrared field, and specifically to G.E.'s expert Canada,[73] as far back as 1946.[74]

The Warshaw Report reveals that he and Canada at G.E. worked with these very materials in their *unsuccessful* development efforts in 1952-1954.[75]

The Orthuber patent, which was filed in 1954 referred to the use of a "bolometer"[76]. The abandoned I.T.T. Orthuber detector that was tested on the Erie and the Rock Island railroads in 1955 described in a letter written by an Erie R.R. engineer as using a *"thermistor bolometer".*[77] that he was working with infrared sensitive *"bolometers".*[78]

Finally, reference to the work of Fattor in 1949 reveals that he was working with infrared sensitive *"bolometers".*[78]

The temperature data for journal boxes, an element in the art which this Court found could lead to an obvious ascertainment of the proper placement of a detector for discerning the optimum target area, was available in several well known public reports commencing as far back as 1940, ten years before the conception of the invention of the patent in suit.

This Court itself found availability of this data in the art, stating: "* * * *the railroads had conducted a great deal of experiment and knew the relative temperatures of the various surfaces of the journal box".*[79]

Further, the evidence establishes that the General Electric Company specifically had available to it at the time of its work back in 1953 and 1954 *"journal box character-*

istics and temperature surveys" made by the Association of American Railroads;[80] that there was available journal box temperature data from the Railway Service and Supply Corporation;[81] that similar information as to time and temperature was made available by the Pennsylvania Railroad; that G.E., and all other workers in the field, also had available a comprehensive report on the temperature patterns of journal boxes made by Armour Research Foundation in 1954;[82] there was also publicly available an American Society of Mechanical Engineers Report entitled *"Temperature Distribution and Sources in a Conventional Railway Journal Box"*[83], dated October 1940, which contained specific information with respect to the temperature patterns of a journal box.

This Court's finding that a: *"possible solution did not exist until the pyrometer was developed in the 1950's"*, is plainly not the fact and must be based upon some misunderstanding of the record evidence. We can find no such contention in the G.E. brief. In any event, the record is replete with references to infrared pyrometers as far back as 1933.[84]

For example, G.E. relied upon a publication disclosing an infrared chopper type pyrometer for measuring heat of objects in a production line assembly, entitled *"Industrial High Speed Infrared Pyrometer"* published in "Electronics" in 1949.[85]

The Vayada patent, No. 1,901,209, also relied upon by G.E., issued March 14, 1933, *about 23 years* before the conception of the invention of the patent in suit, shows an infrared pyrometer for measuring the heat of hot steel billets in a moving production line.[86]

A G.E. publication, also relied upon by defendant as prior art and entitled "The Photoelectric Pyrometer" shows a photoelectric "pyrometer" for monitoring the heat of moving steel billets and other production items.[87] This

publication is dated November 1936, *some 20 years* before the conception of the invention of the patent in suit.

* * * *

Industry Recognition of the '309 Invention as an Answer to the Problem

We appreciate this Court's reference to "commercial success" and agree with its statement that "commercial success" alone will not turn obvious subject matter into invention. However, plaintiff-appellee never relied on "commercial success" alone.

What plaintiff-appellee did rely upon was the existence of facts which overwhelmingly established the fourth objective criteria of invention as denied by Judge Haynsworth in the *Allen* case, namely: "* * * *recognition by the industry that the claimed invention was the answer, and its prompt adoption with attendant commercial success.*"

The findings of this Court do not deal with the factual record with respect to the "recognition" of the claimed invention as "an answer to the problem". However this Court did recognize that "* * * *the commercial success enjoyed by Servo's detector leaves no doubt that it has produced a useful device* * * *".[88]

The master specifically found "recognition" within this criteria. He found: *"The 'Orientation' 309 patent has the characteristics of a 'pioneer' patent. If it does not rise to the full dignity of such, it certainly constituted a major breakthrough in its field. It received wide acclaim, even while still in its experimental stage".*[89]

The District Court found that other criteria and *"the recognition of the invention as an answer* * * * *all add up to the fact that it was not an invention of ordinary skill in the art".*[90]

These findings have not been found to be clearly errone-

ous and when considered in the light of this Court's own finding that the claimed invention *"enjoyed commercial success"* it would seem axiomatic that the fourth objective criteria within the rule of the cases in this circuit, exists in this case.

Certainly the record overwhelmingly establishes "recognition" and "adoption" in a very realistic and practical sense.

In the light of the failure of any of the prior workers to develop a hot box detector that was acceptable to the railroads and the fact that the record does not evidence the detection of an actual hot box under regular operating conditions by any of the prior art devices, the recognition that the claimed invention provided an answer appears to plainly reside in evidence such as that of Ruff, of the Southern Railway stating: *"This is the first definite indication I have had that it is possible to externally scan a freight type journal and evaluate the heat therein".*[91] The General Railway Signal Company, long a major supplier of communication and signalling equipment to railroads, advised the Southern Railway, which was seeking an alternate source of supply, that it doubted it could independently design a better hot box detector for Southern, significantly stated: *"* * * we doubt if more development and research would bring about a better method of indicating hot boxes".*[92] Youngwerth of the Erie R. R., which had earlier tested the I. T. T. (Federal Telephone) Orthuber device, reporting on the ability of the Servo detector to substantially eliminate false signals, stated: *"This to say the least, is remarkable when compared with the results we experienced with the Federal Telephone & Radio Corporation detector at North Judson."*[93] In 1956 when Servo first tested the device, with railroad personnel observing, a report reflects the following occurrence: *"The last freight viewed on July 18 had a known crippled car in it which had been set out the day before for a hot box, and it was being towed down to Harmon*

for repair. The car was picked up about 10 miles up the line, and on passing gave a pulse amplitude about seven times the normal journals. We went immediately to the Peekskill Yard to check this, and discovered the box to be smoking slightly, and considerably above other journals in temperature. This provided Mr. Rockwell with the substantiation he required that the Detective had the sensitivity and reliability for this difficult job, and was positively able to detect potentially dangerous journals."

Petition for Rehearing

Record References

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3. Vol. I, p. 20a**
4. Vol. I, p. 21a
5. Vol. I, p. 22a
6. Vol. I, p. 21a
7. Vol. I, p. 23a
8. Vol. I, p. 149a
9. Vol. I, p. 295a
10. Vol. IV, (PX-438), p. 1252a
11. Vol. III, (PX-121), p. 1084a
12. Vol. III, (PX-41), p. 1012a

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21. Page 5
22. Page 5
23. Page 9

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* All Court of Appeal's Opinion references are to typed copy.

** Plaintiff-Appellee's Appendix so indicated herein.

24. Page 14
25. Page 19
26. Pages 3 & 4
27. Page 7
28. Vol. I, p. 54a
29. Vol. I, p. 54a
30. Vol. I, p. 57a
31. Vol. I, p. 60a
32. Vol. I, p. 61a
33. Vol. I, p. 62a
34. Vol. I, p. 63a
35. Vol. I, p. 63a
36. Vol. I, p. 162a

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68. Page 7, footnote
69. Page 3, footnote
70. Page 7, footnote
71. Vol. I, p. 39a
72. Vol. I, p. 162a
73. Trial Record 4121
74. Vol. III, (PX-5) 942a
75. Vol. III, (PX-288), 1115a
76. Def. Vol. II, (DX-91), p. 2.164
77. Vol. III, (PX-201), p. 1096a
78. Trial Record, pp. 15-16, 35, 38
79. Page 8

80. Vol. IV, (PX-438), p. 1252a
81. Vol. IV, (PX-441), p. 1257a
82. Vol. IV, (PX-343), p. 1137a
83. Trial Record, PX-507
84. Trial Record, DX-109, Tab 7
85. Trial Record, DX-27
86. Trial Record, DX-109, Tab 7
87. Vol. II, (DX-96), p. 2.6
88. Page 7
89. Vol. I, page 41a
90. Vol. I, page 166a
91. Trial Record, p. 2499
92. Vol. III, (PX-283), p. 1114a
93. Vol. III, (PX-216), p. 1097a

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Plaintiff's Exhibit 226 (1101a-1102a)

"Methods of Background Description and Their Utility" by David Robinson, Office of Naval Research (1959), 47 Institute of Radio Engineers Proceedings, pp. 1554-1555:

> "In order to design or evaluate a given infrared system, it is necessary to know the characteristics of the potential targets and backgrounds with which it is expected to deal. The information desired can be put in the form of questions.
>
> 1) What is the probability of detecting a target

in the presence of a given background with a given IR system?

2) What is the probability that a given background will not give a false signal when no target is present?

3) How can one design the system to increase these probabilities?

"Note that it is not only the properties of the background which are involved here. Of vital importance also are the properties of both the target and the IR system which is being used.

* * * *

"* * * Since there are many possible types of backgrounds and, many conditions of viewing it, it would be extremely difficult to use such methods to evaluate an infrared system even if this information were collected. * * *"

Testimony of Dr. Stanley S. Ballard

Q. Could you tell the Court what you understand to be the system that is proposed in that patent? A. Well, the basic problem of hotbox detection is the one that comes to mind first—may I say a few words about that, or do you want me to talk about this specific——

Q. Whatever you think would be enlightening. A. My training has been considerable in military problems which have a certain pattern to them; and I've been interested to compare them with civilian problems such as (1805) this one and to try to feel for some of the similarities and dissimilarities.

The basic problem in infrared instrumentation, however, is always that of identifyng the source of interest, which we call the "target" in military parlance, and I'll call it that if no one objects—identifying the target or

measuring the position or nature of the target. And the target must always be considered in relation to the surroundings—the background, as it is commonly called, although there may not be objects in back of it; but objects surrounding the target.

In fact, all discrimination problems come down to how accurately can you distinguish the target in the presence of whatever surroundings there are.

Now, in a laboratory you can set up an ideal situation where the target is a hot object and everything around it is uniformly at a cooler temperature, and this is child's play to make measurements of this sort.

Outdoors, however, where the weather is changing, where the sun is coming on and off, the ambient temperature is going up and down, the problem is one of entirely greater magnitude.

Another thing that I always think about or try to think about when I am considering infrared systems, (1806) particularly one like this, is that when we are working at these wave lengths, using a thermistor bolometer, for instance, the world looks entirely different from what it does to our eyes. As we look around the room we see things because of the color differences, the reflectivities, the way the light falls on them, and so on.

However, if we replaced our eyes by thermistor bolometers—which I don't propose—and look around, the whole room would look incandescent, because to a thermistor bolometer, to something that is sensitive to those wave lengths, the walls are incandescent, the furniture is incandescent, the people are somewhat more incandescent because their surface temperature is a little higher.

So it is like looking into a fiery furnace and looking for places that are a little more fiery, a little hotter or brighter than other places.

And this is the problem that any infrared device has, indoors or out of doors.

But you can see how much more complicated it is out of doors, since sunlight is very high temperature radiation, and even scattered sunlight, from clouds or from terrain, is a stronger heat source than perhaps the things you might be looking for.

(1807)

Q. You have reviewed some of this material and some of the testimony and is this problem complicated not only by being outdoors in varying atmospheres, but is it complicated because you have a moving target which itself has unpredictable surroundings and unpredictable background? A. Yes, I have been impressed in studying the hotbox problem, which I hadn't done until fairly recently, at the fact that it is a very subtle and complicated problem. In fact, in some ways it is a tougher problem than these military problems that I have been talking about, like the "Sidewinder" missile, for instance, which we all read about now, because you are looking at a dynamic situation that is changing all of the time and you are interested in just a little piece of information, namely, the hotbox flashes by. But this has to be interpreted vis-a-vis all of the surroundings both in space and in time. So I think that it is a very complicated problem and, if I may say so, I believe that the Servo engineers have come out with a very elegant solution of it.

• • • •

Q. Does this differ from what you might term to be an absolute measurement of some kind or other? A. Yes. Absolute measurements, such as you might make with a pyrometer with an internal standard, internal temperature standard, are entirely different from the type of field measurements made in a dynamic situation. In fact, I don't see how the two are much more alike than apples and oranges, to use the old statement.

In one case, you make repetitive long-term, take-your-

time measurements against a carefully controlled laboratory standard. In another case, you have to catch the information on the fly in the presence of usually unfavorable circumstances, which you certainly get in a hotbox detector situation.

(1811)

Q. When reading a stationary target, I understand in order to obtain a reference of some kind or other you employ what is commonly known as a "chopper." Will you describe for us what that is? A. A chopper is a little wheel like a shrunk down fan blade business, it may be several blades, which rotates in the beam or path of light coming from the target through the optical system to the detector. It has several purposes: One is to give a so-called chopping frequency which the electronics can be designed around. It is better to use alternating current systems than direct current systems so as to get away from the drift problem.

Another, is to make it possible to insert a reference temperature into the system. Sometimes this is the back of the chopper blade, but in the more elegant systems the chopper is a mirror and permits the detector to see either the target or when the blade is in place to see a black body source, controlled temperature source, which is off to the side.

Always of course with a device like this you get many impulses a second, whatever the chopping frequency is, so it is quite different from a field measurement where you have to catch things on a fly.

Q. We have had some testimony in this case to the effect that the thermistor bolometer was the most practical selection of a detecting element for reading hotboxes. Could you tell me what you think of the practicability of using a thermistor bolometer in connection with a chopping system? A. We never use a chopping system if you don't have to. It just complicates life. It is another mov-

ing part to go wrong. Also, with a chopping system you have to watch the chopping frequency because if that is greater than the inverse of the time constant of the detector, then you don't get full detector response. The thermistor bolometer is only a medium fast detector, depends on your point of view, so that one cannot chop more than, oh, a hundred or two hundred times a second, I imagine, with a thermistor bolometer and get its full detector sensitivity.

Testimony of Alfred H. Canada
General Electric Co. Infra Red Expert

(634a; 635a; PX-455 Def. Vol. II p. 2.133; 1120a) (Emphasis added).

"Q. What do you mean by 'different kind of problem'? A. The axle box detector demonstrated by British Thompson-Houston was in a subway and not subject to ambient radiation. An initial problem in developing one for American railroads' use was the *necessity of operating this in broad daylight* without solar and ambient interference. This was one of the first problems to which we addressed our work."

• • • •

"Q. Was the angle of view of the detector considered a problem? A. I don't think 'problem' in that sense. As the British Thompson-Houston report had noted and as I think we have noted in these, we had knowledge of the best place to look to see the hottest spot or the most likely spot so they approached it not as a problem. I can recall a number of trips to the New York Central yards to sit there and look at the side of a number of different boxcars to decide where one ought to be in order to see the spots going by. I recall on some types of boxcars the ladders on the side hung down different distances. As

was pointed out in British Thompson-Houston report and in our studies, we desired to locate this (4152) in such a manner that we could see the hot journal box go by, obviously avoid other objects that might also be hot, and avoid any more looks than were necessary either between cars or under the cars; so that we saw wheel shadows going by. At this time; to keep the apparatus simple, we were aiming at simply a device that, without any tripping at particular times, could operate on trackside twenty-four hours a day, turned on, and only see hot journal boxes go by. *This may have been a large order* but it was worthwhile in the project simply because it would eventually contribute to a less complex apparatus.

• • • •

"A few weeks ago, after many months of discussion of the commercial feasibility of a hot journal detector, if it could be successfully developed, we undertook a *pioneer* development to obtain a feel for the problems involved in the detection of a hot journal on a railroad car and then nail down some of these problems with measured numbers that could later be used in the direct development of equipment. As you know, the basis for taking out a pioneer development on such an item, rather than undertaking a direct requisition to supply such an equipment to a railroad or to go directly into a design and development authorization, was that *a serious problem—that of daylight operation—had not been met nor were we very sure of satisfactory solutions in this respect.* The work of the British Thompson-Houston Company on the forerunner of this equipment all was conducted in a subway tunnel, so avoided this most serious problem in hot journal detection.

• • • •

"This shouldn't be taken as discouraging for, after all, this is a pioneer development and, as such, we knew in the beginning that there *were problems that might not yield*

to satisfactory answer. At this time the outlook for sufficient daylight discrimination looks fairly hopeful, but by no means sufficiently assured to start to schedule delivery of hot journal detector units to railroads."

• • • •

Plaintiff's Exhibit 289

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X-RAY DEPARTMENT

GENERAL [*GE*] ELECTRIC

ENGINEERING DIVISION

TECHNICAL INFORMATION SERIES

TITLE PAGE

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Title

EVALUATION OF PbS CELL DETECTION SYSTEM FOR RAILROAD JOURNAL BOX TEMPERATURES

Abstract

A completely automatic [redacted] for the determination

and recording of railroad journal box temperatures has been placed in operation on the Milwaukee Road's main line at Brookfield, Wisconsin.

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Advanced Development Lab.

No. pages 4

Conclusions

The system as now installed is capable of detecting journal box temperatures exceeding 70°C at train speeds below 35 mph. The signals due to the journal boxes are masked by two spurious ones, the reflection of the sun's radiation by the journal box in the daytime and the signals from the brake shoes at all times. The signals due to the brake shoes can be discriminated against, but short of direct shielding of the journal from the sun's radiation there appears to be no satisfactory answer to the latter.

Testimony of Edward G. Menaker
G. E. Expert at Trial

(861a)

"From what I have seen of it, it is a pretty complicated phenomena because there are several parts of this bolometer amplifier combination which are involved in the results that take place under this circumstance. For one thing, as I have explained, the bolometer goes up in temperature and therefore if no interval takes place between the time the bolometer gets hot and the box comes into view and the next thing it sees is a box which is cooler than the thing it was looking at it for, so it seems this box is relatively cold. So the output then is going to be some low value.

Now if the thing we are looking at before had a temperature, say, of 500 degrees and a journal box came by which was really a hotbox, things were in pretty tough shape, and let's say the box itself was at a temperature of 200 degrees and you couldn't put your hand on it, then the result of that would be that the bolometer says this box is really cool because it's much cooler than the 500 degrees I was just looking at, so it would say this box is cool. Now if some little interval took place between the time that it saw this real hot thing and the time it saw a box, and during that interval it was looking at something cool, then it would depend on how long that interval was, and all of the parts of the amplifier and how rapidly they reassumed to give the original condition in order to determine whether what it would see next would look unduly hot or whether it would look unduly cool or whether it would look the way it should."

"Q. [Master]: Isn't that what you call getting a reference before each reading then? A. I would say that that is essentially getting a reference before each reading."

Testimony of William D. Cockrell, G. E. Engineer

(Trial transcript, pp. 4365-4366).

"Q. Tell me, Mr. Cockrell, when you got into this project, and had this equipment why did you not consider building a detector that was designed substantially like the one that is shown here [Canada and Warshaw work] that had already been developed by G. E.? A. The word "developed" is a little tricky word to use there. This is a study—there again, gentlemen, I am here at the ninth inning, I hope it's the ninth, and this was a business course study in which the man took various parts and put them together I am not sure from the report, Mr. Canada's letter there, rather, to Mr. Hutchins, who is our manager of marketing and might make up such a product as that, that indicates that the whole thing as the picture shows, was never operated, or whether it was the principles had been proven on these photographs or sketch of the Warshaw Patent. The particular idea of this case was to look down, I believe, at the 11°, or something above horizontal obviously, if we are going to put something on the tracks requested by our customers Southern and Norfolk & Western, we would not build that particular equipment.

Q. Did you ever see this model? A. No, I did not.

Q. Did you ever see a model built like this any place? A. No.

Q. Does it exist in the General Electric Company? A. I do not know.

Q. But you have never seen it? A. I have never seen it.

Q. This would not then be a commercial device that you would offer to a railroad or something of that sort; is that correct? A. That is correct."